Z Technology

MeterMate Software

USER MANUAL

Version 2 for MeterMate Release 2

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Section 1: Introduction to MeterMate

MeterMate is a Windows application that communicates with a Z Technology R500 series Field Strength meter via its RS-232 serial port to monitor or record to a log file Field Strength measurements of a single frequency. For monitoring purposes, the user may select a time delay between measurements from 1 second to 24 hours. If no delay is selected the measurement time is about 200 mS per measurement. MeterMate is also GPS aware and will tag Field Strength measurements with GPS location. Once tagged with GPS coordinates powerful mapping analysis can be done. MeterMate is packaged with an Export Wizard that can create files for import into applications such as Microsoft MapPoint, and Golden Software's Surfer 3D surface mapping. MapPoint allows you to create a colored dot trail on a map where each color represents a signal level range and the location of the dot on the map indicates the location of the measurement. Surfer allows you to create a colored contour image of the measurement area where each color represents a range of signal strength. The Export wizard also supports other applications like RadioSoft, for comparing measured data with predicted signal strength. A generic format allows the user to create import files for applications like an Excel spreadsheet.

This manual will describe how to install and operate MeterMate and the Export Wizard on the users windows based PC with a Z Technology R-500 series field strength meter. For specific descriptions of the Meter and it's operation see the Meter User Manual.

If the PC has Microsoft MapPoint and/or Surfer a tool bar button will appear in MeterMate to access those programs directly from within MeterMate. Additionally it will describe

- How to export collected data and import into Microsoft Excel and display a time plot of collected data.
- How to export collected data and import into Microsoft MapPoint and display a dot plot of collected data over a street map.
- How to export collected data and import into Golden Software Surfer and display a color contour plot of the measurement area.

Section 2: MeterMate Specifications

MeterMate Specifications	
Application	R-500 series meter control software for Windows 98/2K/XP based computers. 1. Virtual meter front panel (Meter Tab) allows user to monitor measurements, set frequency, set RF Amplifier level, set IF Bandwidth, Enable/Disable Audio, assign a call sign or frequency name for log file. 2. Toolbar buttons to sample or record measurements, start Data Export Wizard, start Microsoft MapPoint (if installed), start Golden Software Surfer (if installed.) 3. User Settings (Settings Tab) allows user to set measurement units in dBm, dBuV, dBuV/m, mV, mV/m, uV, uV/m, assign an Antenna Factor, enable and specify a delay between measurements from 1 second to 24 hours. Enable and specify GPS COM port. (a second RS-232 serial port is required) Specify the COM port the meter is connected to. 4. Textual list display of measurements (Logging Tab) Displays a list of recent measurements for user comparison. 5. GPS status display (if GPS is connected)
Data Storage	Data Stored on PC Hard Drive to user specified folder, default is “My Documents”
Data Format	Format is comma delimited nonproprietary files accessible for importing into other standard utilities. If GPS is not enabled recorded data is: PC date, PC time, frequency, frequency units, signal strength, signal strength units, blank, blank, Frequency Name, Antenna Factor. If GPS is enabled, recorded data is: PC date, PC time, frequency, frequency units, signal strength, signal strength units, latitude, longitude, Frequency Name, Antenna Factor, Altitude, Altitude Units, Heading, Heading Units, Speed, Speed Units, Quality, Satellites, HDOP, GPS UTC time. .

Computer Requirements	
Computer (Not Included)	Pentium class, 200 MHz, 32 Mb Memory, 6 Megabyes Hard Drive space, or better running US Windows 98/2K/XP, RS-232 serial port. If PC is a laptop, and not equipped with a built in serial port Z Technology recommends a PCMCIA to Serial adapter from Socket Communications. For single serial port: model SLO707-078 - Rugged Serial I/O. For two serial ports model SLO723-116 - Rugged Dual Serial I/O. (USB to Serial adapters are not recommended fo connection to the Meter. USB to Serial adapters are okay however for GPS connection.)

Section 3: Installation

Your R-500 series meter is supplied with a CDROM labeled "**MeterMate**" This installation requires a Windows98/XP PC with an RS232 serial port. Many PC's have a built in RS232 serial port with 9 pin connector on the back panel of the PC. If your PC does not have an RS232 Serial port you can install a PCMCIA type serial port adapter in a Laptop PC or a PCI serial port adapter board in a desktop PC. USB serial port adapters are not recommended for use with the R-500 series meters. Software installation follows the normal Windows application installation procedure.

- Insert the CDROM labeled "**MeterMate**" into your CDROM drive.
- The CDROM will automatically begin to load the Installation program.
- If this does not occur, click the **Start** button select **Run**
- Browse to the **D:** drive (or the letter of your CDROM drive)
- Select Setup.exe
- Click **OK**
- The **MeterMate Installation** screen will appear

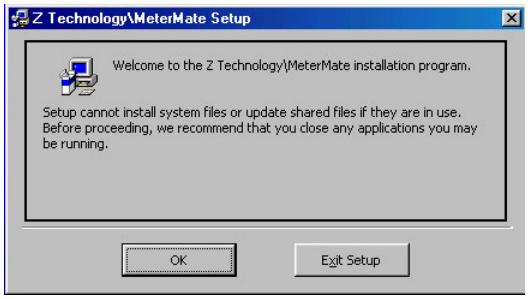

Z Technology\MeterMate Setup
Welcome to the Z Technology\MeterMate installation program.
Setup cannot install system files or update shared files if they are in use. Before proceeding, we recommend that you close any applications you may be running.
OK
Exit Setup

Figure 1: MeterMate Installation Screen

Click "OK", to proceed with the installation.

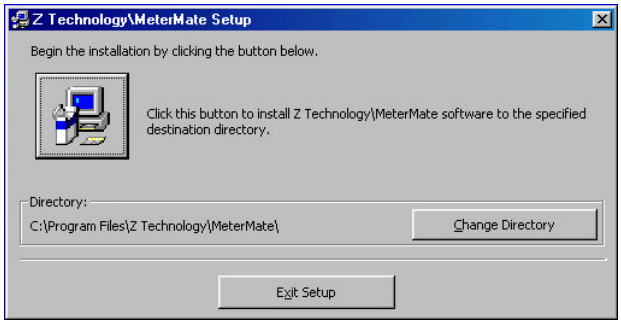

Z Technology\MeterMate Setup
Begin the installation by clicking the button below.
Click this button to install Z Technology\MeterMate software to the specified destination directory.
Directory:
C:\Program Files\Z Technology\MeterMate\
Change Directory
Exit Setup

Figure 2: MeterMate Installation destination screen

Click on the computer picture button to install MeterMate in the default directory, or Click on the “Change Directory” button to install MeterMate somewhere else.

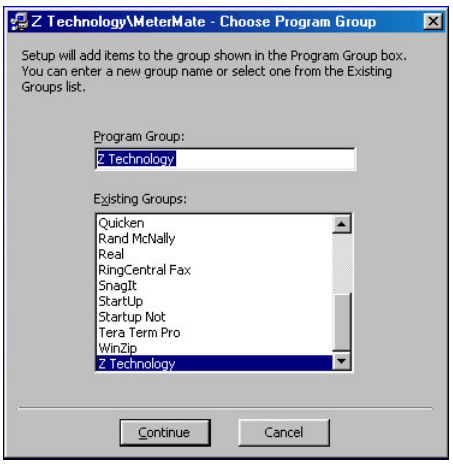


Figure 3: MeterMate Installation Program Group

Click on “Continue” to install MeterMate in the Z Technology program group. The Z Technology program group will be created in not already present.

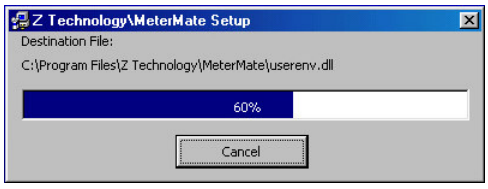


Figure 4: MeterMate Installation progress bar

During MeterMate installation, the progress bar will move from 0% to 100%.

Figure 5: MeterMate Installation complete

Click “OK” exit the Installation.

Section 4: Operation

First Time Operation

Before the MeterMate application can communicate with the meter, the meter must be in "Remote mode" The display of the meter shows "1 Port" when the meter is in Remote mode.

Put the meter in Remote mode:

- Turn the meter on
- Press the meter FUNCTION button
- Turn the TUNE knob counterclockwise to F93
- Press the FUNCTION button

Start MeterMate:

- Click the "START" button
- For Windows98 click "Program", for WindowsXP click "All Programs"
- Click "Z Technology"
- Click "MeterMate"

  To place a MeterMate shortcut on you desktop:

  - Click the "START" button
  - For Windows98 click "Program", for WindowsXP click "All Programs"
  - Click "Z Technology"
  - Right Click "MeterMate"
  - Click "Send to"
  - Click "Desktop (as Shortcut)"

The first time startup MeterMate screen asks if you would like instructions on putting the meter in remote mode, Click Yes for instructions, click No to continue.

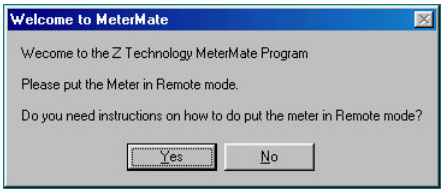

Welcome to MeterMate
Wecome to the Z Technology MeterMate Program
Please put the Meter in Remote mode.
Do you need instructions on how to do put the meter in Remote mode?
Yes
No

Figure 6: Need instructions to put meter in remote mode?

When MeterMate starts for the first time, it will assume that the meter is connected to the PC's COM1 Port, that the meter is turned on and in Remote mode. If your meter is connected to a different COM port, the program will error, then allow you to move to the "Settings" tab and set the correct COM port for your PC. Once set, the COM port number is remembered for the next time MeterMate is started.

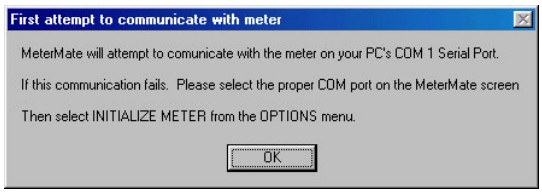
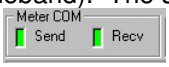

First attempt to communicate with meter
MeterMate will attempt to comunicate with the meter on your PC's COM 1 Serial Port.
If this communication fails. Please select the proper COM port on the MeterMate screen
Then select INITIALIZE METER from the OPTIONS menu.
OK

Figure 7: First Attempt to Communicate with meter

Click "OK", the MeterMate application starts and attempts to initialize the meter.

Figure 8: Initializing the meter

The bottom line of the display is the Status line.

Here it shows the meter IF Bandwidth has just been set to WB (wideband). The status line also shows the current PC time and data. Above the status line is 

a Meter Communication indicator. The Send and Recv lights flash green when there is communication with the meter. They are flashing green in this example of initialization. To the right is the Initialization Progress bar. It shows the progress of the initialization process. When complete the MeterMate application is ready for user interaction. The "Meter" Tab is visible. The user may type in a frequency, press "ENTER" to make the meter change to that frequency, then click on the "Sample" button or the "Sample Continuous" button tool bar to see the measurement data appear in the "Signal Level" section of the Meter Tab.

Meter Tab

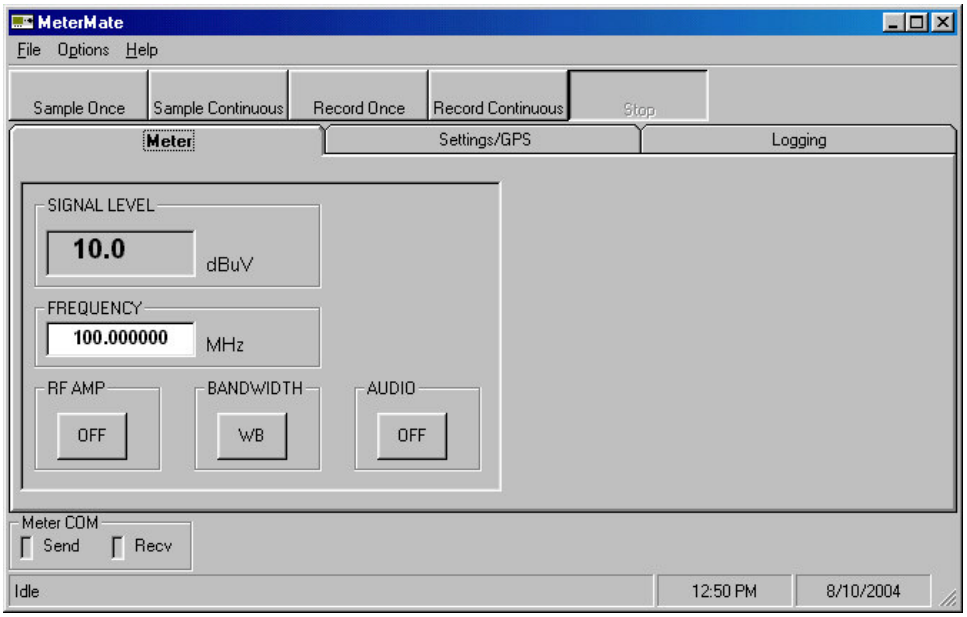


Figure 9: Meter Tab

The "Meter" Tab is one of the three MeterMate viewable tabs. It can be thought of as a virtual meter front panel. It displays measurement results in the Signal Level box. The current frequency is displayed in the "Frequency" box. To change the frequency, click in the "Frequency" box, the numbers will turn red. Type in the desired frequency, then press "ENTER" on the keyboard, the numbers turn black indicating the frequency of the meter has been changed. The "RF AMP", and "BANDWIDTH" buttons show the state of the meter RF Amp, and IF Bandwidth respectively. Clicking the buttons toggles the state. Similarly the "AUDIO" button shows the state of the meters Audio decoder. Clicking the button toggles the state.

Settings/GPS Tab

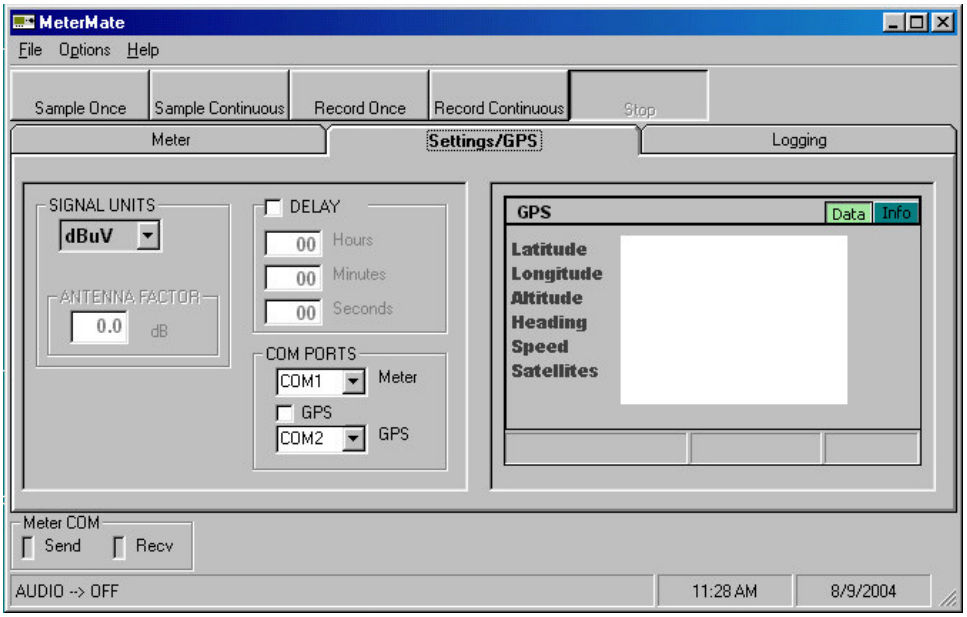


Figure 10: Settings/GPS tab

The Settings/GPS tab has two parts. The left pane allows the user to set the Signal Units. Signal units can be dBm, dBuV, uV, uV/M, mV, mV/M or dBuV/M. If dBuV/M, uV/M or mV/M is selected then an antenna factor can be entered. The antenna factor is added to the dBuV measurement received from the meter to create dBuV/M signal units. A delay between measurements can be enabled by checking the "DELAY" checkbox. When the DELAY is enabled a delay in hours, minutes, and seconds can be entered. The COM Port box allows the user to select a different PC COM for meter communication, and to enable a second COM port for GPS communication. The GPS checkbox enables the selected GPS COM port. When the GPS checkbox is checked, the right pane of the Settings/GPS tab becomes active. The right pane displays GPS status.

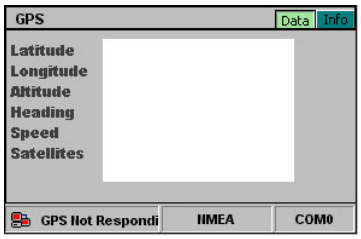


Figure 11: GPS Port does not exist

Notice the GPS status line at the bottom shows "GPS Not Responding" and the COM number on the bottom right shows "COM0" no matter what COM port was selected. This means the selected COM port does not exist.

When the selected GPS port exists and is connected but no information is coming from the GPS, the GPS status line shows “GPS Not Responding” and the COM port number is the true COM port selected as shown in the figure below:

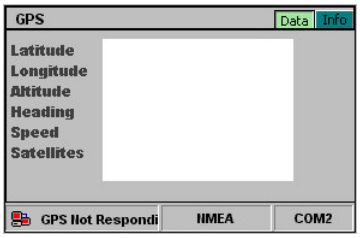


Figure 12: GPS Port exists but no communication

When the GPS port selected exists, is connected and information is coming from the GPS the Communication indicator at the left side of the GPS status line blinks green, and the Status line shows “GPS sending Data” as shown in the figure below:

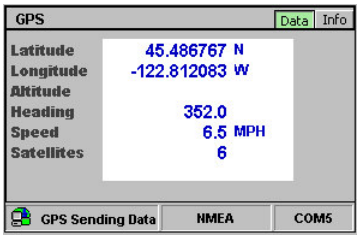


Figure 13: GPS Port exists and is communicating

Using a Block Converter

There are two special issues to be aware of when using a Field Strength Meter in combination with a Block Converter and controlling the combined system with MeterMate.

First, MeterMate can be used with a Field Strength Meter and Block Converter combination. When this is done, care must be taken to correctly set the frequency in the MeterMate “Frequency” Box. Since a Block Converter offsets the received frequency to one within the tuning range of the Meter, MeterMate must set the Meter to the offset frequency not the Block Converter’s received frequency.

As an example, when using a low frequency block converter, **BC-BCB**, the frequency to be entered into the “Frequency” Box in MeterMate must be 10.000MHz above the desired AM band receive frequency. Therefore, in order to measure an AM station at 800KHz, the frequency of 10.800MHz must be used in MeterMate.

One additional requirement for proper Field Strength Meter operation with MeterMate is setting of Function F13. The “BC” setting found under this Function is designed for use when operating the Meter directly from the instrument’s front panel. When controlling the unit with MeterMate, F13 must be set in “STD” mode.

Finally when using MeterMate, always set the Field Strength Meter to read in dBuV on the LCD display. This is the default setting for the Meter. Use the SIGNAL UNITS box under the "Settings/GPS" tab to select other units of measure such as dBuV/M or dBm. Since the Block Converter has zero (0) conversion gain/loss, the Field Strength Meter power reading in dBuV will be equal the reading in dBuV at the input to the Block Converter.

Logging Tab

The "Logging" tab lists measurements in line format as they would appear in a log file. The list can be scrolled. The Logging tab will keep a scrollable buffer of up to 16000 characters.

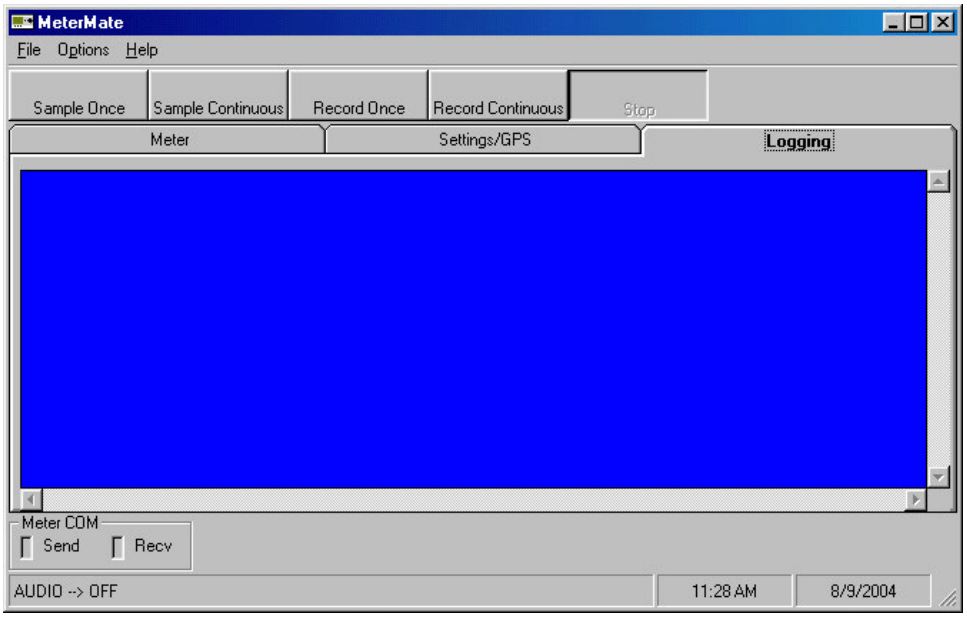


Figure 14: Logging tab

Notice that as measurements are made lines are added to the Logging tab. If a one of the two recording buttons was used to make the measurements, the line is added to the log file as a measurement record. The "Send" "Recv" lights flash in the Meter COM box when the PC is sending the command to make a measurement to the meter, and when the meter responds with the measurement. The status line shows the count in Hours, Minutes, Seconds till the next measurement if a delay between measurements has been enabled on the Settings/GPS tab.

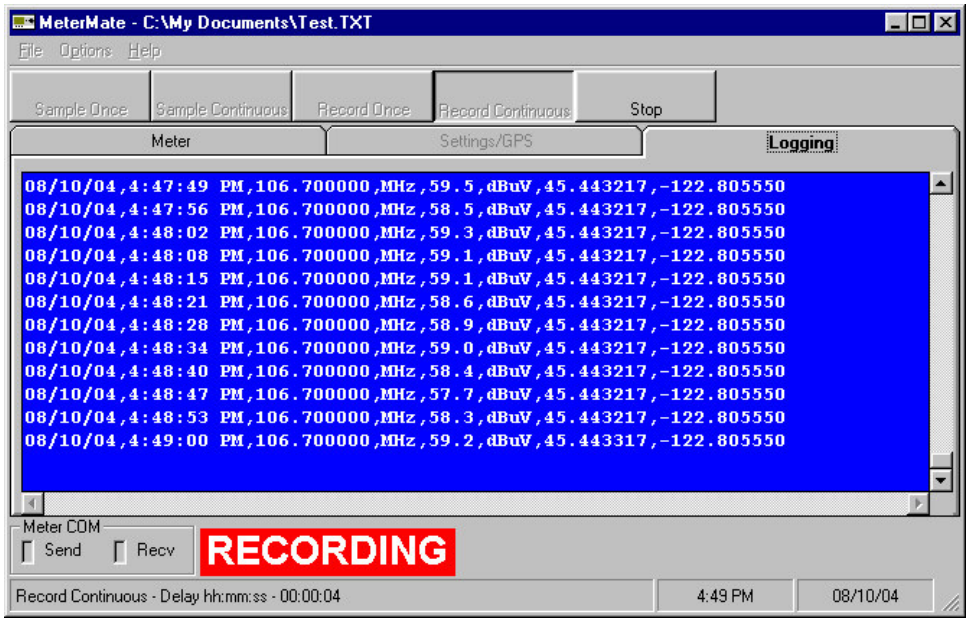
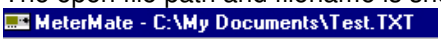


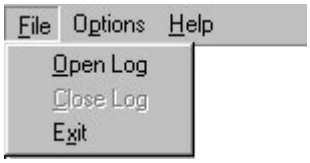
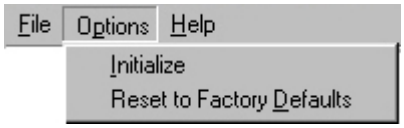
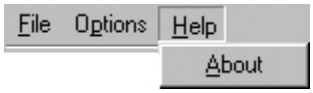
Figure 15: Logging tab while recording data

The red RECORDING message indicating that data is being saved to the open file. The open file path and filename is shown in the MeterMate title bar.



Menu Bar

The menu bar contains 3 menu selections.

	**File Menu** ➢ Creates a **New Data File** to record data ➢ Closes an **Open Data File** ➢ **Exit** the program
	**Options Menu** ➢ Initializes the meter ➢ Resets MeterMate to factory defaults
	**Help Menu** ➢ Displays software version

Tool Bar

When pressed, instructs the meter to take a measurement on the current frequency and display the measurement in the Signal Level box in the Meter Tab, as well as display a measurement record in the Logging Tab.

When pressed, instructs the meter to take continuous measurements on the current frequency and display the measurement in the Signal Level box in the Meter tab, as well as display a measurement record in the Logging Tab. If a delay is enabled in the Settings/GPS tab, the delay period will expire before the next measurement is made. A delay count down appears in the status line at the bottom of the screen. Press the "Stop" button to conclude the sampling session.

When pressed, instructs the meter to take a measurement on the current frequency and display the measurement in the Signal Level box in the Meter Tab, as well as display a measurement record in the Logging Tab. If a recording file is open the measurement record will append to the open file. If a recording file is not open, MeterMate will open a "File Open" browse window and ask the user for a file name to save the measurement records to. If a file that already exists is selected MeterMate will ask the user if they would like to Append to the file or overwrite the file.

When pressed, instructs the meter to take continuous measurements on the current frequency and display the measurement in the Signal Level box in the Meter tab, as well as display a measurement record in the Logging Tab. If a delay is enabled in the Settings/GPS tab, the delay period will expire before the next measurement is made. A delay count down appears in the status line at the bottom of the screen. If a recording file is open the measurement record will append to the open file. If a recording file is not open, MeterMate will open a "File Open" browse window and ask the user for a file name to save the measurement records to. If a file that already exists is selected MeterMate will ask the user if they would like to Append to the file or overwrite the file. Press the "Stop" button to conclude the recording session.

When pressed, stops the Continuous sampling or recording session

About Recording

MeterMate always appends measurement records to an open file. If no file is open and a Record button is pressed, MeterMate will ask for a file to record measurement data to. If a file that already exists is selected MeterMate will ask if the file is to be appended or overwritten. After each measurement the recording file is saved (but still open). No recorded data is lost if for some reason the PC locks up or stops operating.

Example recorded data file

Below is an example of a recorded data file

```
08/10/04,5:55:14 PM,106.700000,MHz,58.9,dBuV,45.477900,-122.670650
08/10/04,5:55:15 PM,106.700000,MHz,58.7,dBuV,45.477900,-122.670650
08/10/04,5:55:15 PM,106.700000,MHz,58.9,dBuV,45.477900,-122.670650
08/10/04,5:55:15 PM,106.700000,MHz,58.9,dBuV,45.477900,-122.670650
08/10/04,5:55:15 PM,106.700000,MHz,58.6,dBuV,45.477900,-122.670650
08/10/04,5:55:15 PM,106.700000,MHz,58.6,dBuV,45.477900,-122.670650
08/10/04,5:55:15 PM,106.700000,MHz,58.7,dBuV,45.477900,-122.670650
```

USB style GPS Receivers

USB style GPS receivers generally use a “virtual” COM port. Plugging in the USB GPS receiver causes the PC to create a “virtual” COM port. The “virtual” COM port is only present when the USB GPS receiver is plugged in. Therefore be sure to plug in the USB GPS receiver before starting the MeterMate application.

COM Ports in Windows Device Manager

In order to determine what COM ports are available on your PC Windows has a tool called the “Device Manager” that allows the user to see what hardware devices are connected to the PC. Use the Device Manager to determine if your PC has COM Ports and if so what COM ports it has available for connection to a meter or GPS.

To open Windows98 Device Manager:

- Right click on the My Computer icon on the desktop
- Click on “Properties”
- Click on the “Device Manger” tab

To Open WindowsXP Device Manager

- Click on “START”
- Right click on “My Computer”
- Click on “Properties”
- Click on the “Hardware” tab
- Click on the Device Manager button

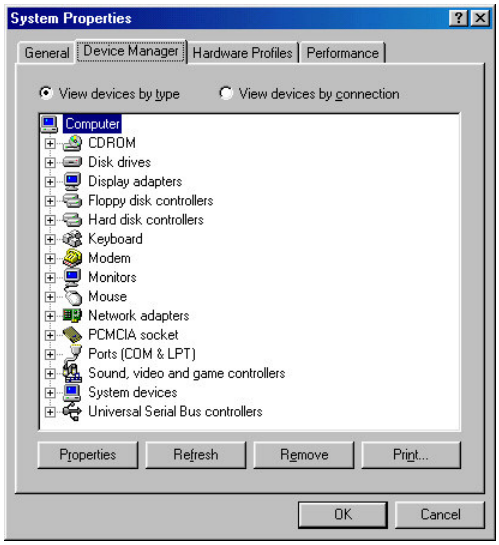


Figure 16: Device Manager tab

Once the device manager is open to see a list of available COM ports.

- Double click on Ports(COM and LPT)

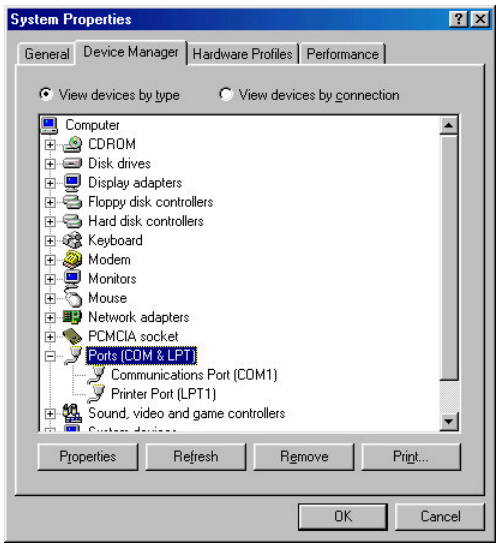


Figure 17: Available COM & LPT ports

In this example there is a COM1 port available. Also notice that this example shows a modem in installed. A modem may use a COM port that does not show up in the list of available COM ports. The same is true of an IR (infrared) port. Do not assign the meter or the GPS to a port used by a modem or a infrared interface.

Section 5: Import data to other Applications

Why import to other applications

Measurement information by itself is sometimes confusing to analyze especially if you have a lot of data. The MeterMate program automates the measurement process allowing you to gather a lot of measurement data very quickly, or spread your measurements out over time to do long term measurement sessions. Viewing your data graphically with a spreadsheet program like Excel may sometimes give you further insights into your data.

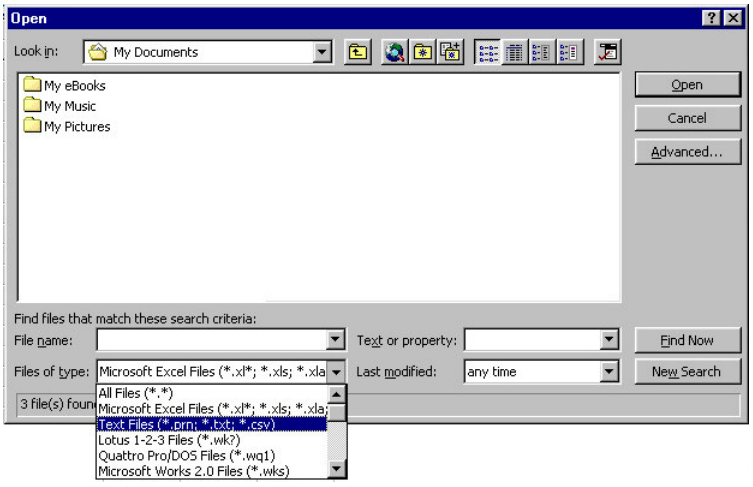
With the addition of GPS capability, each measurement may be tagged with a GPS location, This allows the data to be imported into popular mapping programs. Microsoft MapPoint is one such program that allows direct import of data to create colored symbols that represent different field strength values. This visual representation allows you to quickly identify weak signal areas.

When enough data is collected, the data can be used to interpolate what a signal level would be at a near by location inaccessible for measurement. There are a number of applications that will do prediction of non measured areas based on results of measured areas. The result is a contour map of lines or colors representing signal strength levels. "Surfer" by Golden Software www.goldensoftware.com is one such commercial application. Another "3Dfields" by Vladimir Galouchko www.3dfmaps.com is a shareware application.

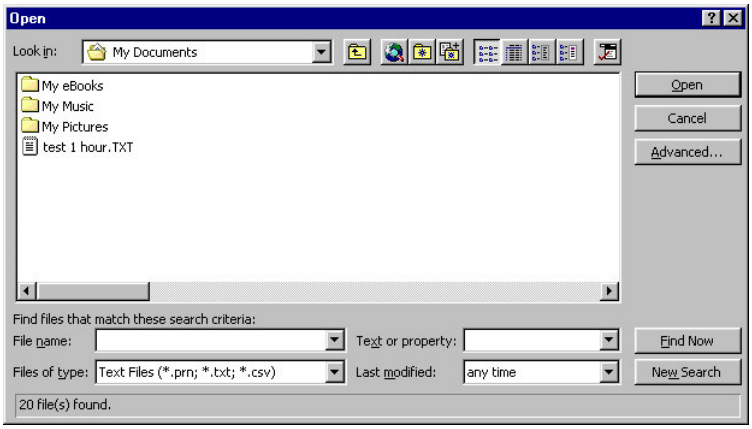
Using the Excel import Wizard

Importing to Excel allows you to use an Excel Chart to view your data. One such handy application of this is to view your data over time in graphic format. Below is an example of data taken over time with the MeterMate application, then graphed with Excel.

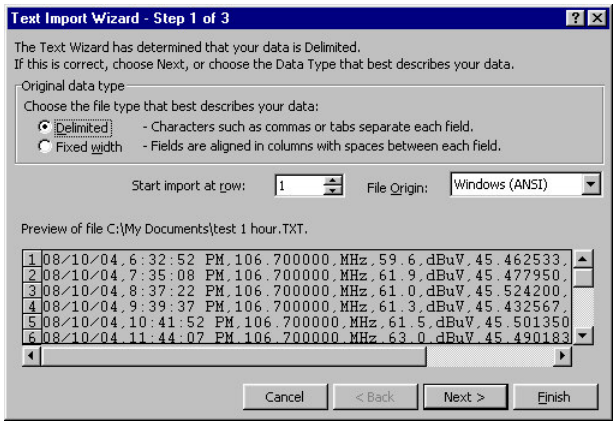
- Open Excel
- Click the "File" menu then click "Open" this will open a file "Open" browse window
- On the "Files of Type" box select "Text Files (*.prn; *.txt; *.csv)



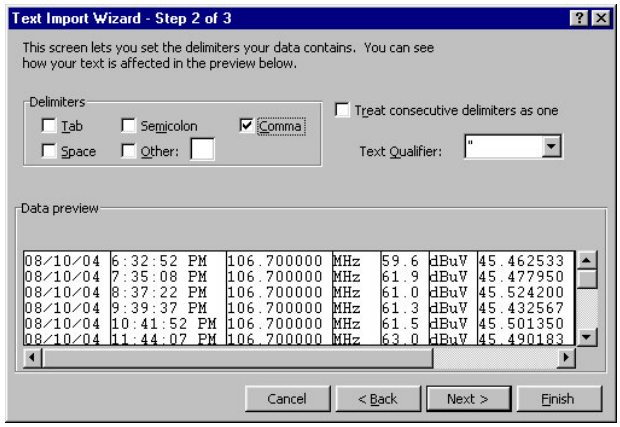
- Browse to the file you wish to import. In this case C:\My Documents\test 1hour.TXT



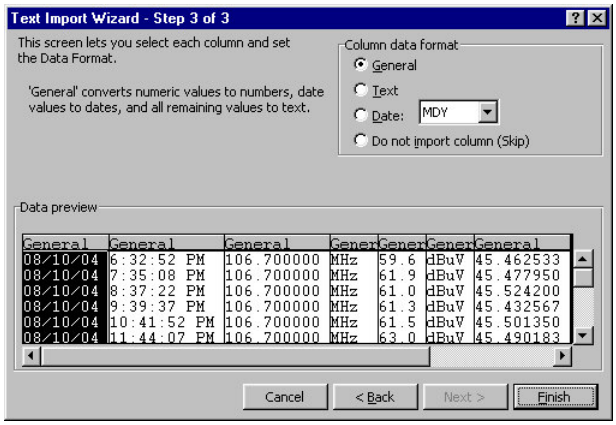
- Click on the file you want to import then click on the “Open” button. The “Text Import Wizard Step 1 of 3” window appears


Text Import Wizard - Step 1 of 3
The Text Wizard has determined that your data is Delimited.
If this is correct, choose Next, or choose the Data Type that best describes your data.
Original data type
Choose the file type that best describes your data:
Delimited - Characters such as commas or tabs separate each field.
Fixed width - Fields are aligned in columns with spaces between each field.
Start import at row:
1
File Origin:
Windows (ANSI)
Preview of file C:\My Documents\test 1 hour.TXT.
1 08/10/04,6:32:52 PM,106.700000,MHz,59.6,dBuV,45.462533,
2 08/10/04,7:35:08 PM,106.700000,MHz,61.9,dBuV,45.477950,
3 08/10/04,8:37:22 PM,106.700000,MHz,61.0,dBuV,45.524200,
4 08/10/04,9:39:37 PM,106.700000,MHz,61.3,dBuV,45.432567,
5 08/10/04,10:41:52 PM,106.700000,MHz,61.5,dBuV,45.501350
6 08/10/04,11:44:07 PM,106.700000,MHz,63.0,dBuV,45.490183
Cancel
< Back
Next >
Finish

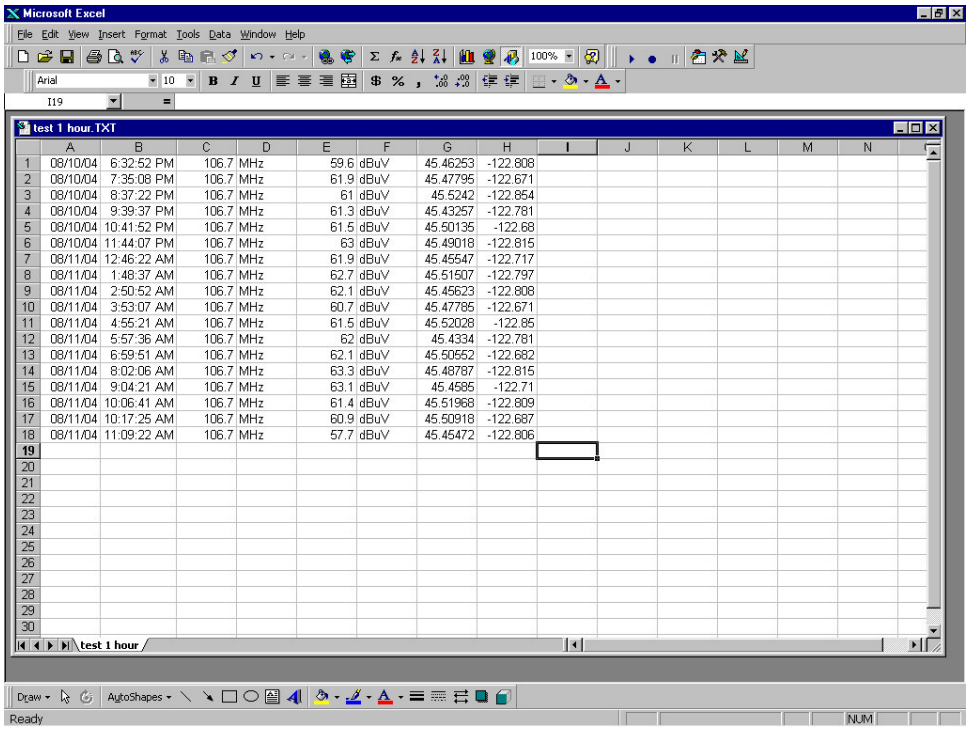
- Click “Next”, the “Text Import Wizard Step 2 of 3” window appears.


Text Import Wizard - Step 2 of 3
This screen lets you set the delimiters your data contains. You can see how your text is affected in the preview below.
Delimiters
Tab
Semicolon
Comma
Space
Other:
Treat consecutive delimiters as one
Text Qualifier:
"
Data preview
08/10/04 6:32:52 PM 106.700000 MHz 59.6 dBuV 45.462533
08/10/04 7:35:08 PM 106.700000 MHz 61.9 dBuV 45.477950
08/10/04 8:37:22 PM 106.700000 MHz 61.0 dBuV 45.524200
08/10/04 9:39:37 PM 106.700000 MHz 61.3 dBuV 45.432567
08/10/04 10:41:52 PM 106.700000 MHz 61.5 dBuV 45.501350
08/10/04 11:44:07 PM 106.700000 MHz 63.0 dBuV 45.490183
Cancel
< Back
Next >
Finish

- Un-check the “Tab” box and click the “Comma” box note that the fields line up in columns in the text display. Click “Next”, the “Text Import Wizard Step 3 of 3” appears.


Text Import Wizard - Step 3 of 3
This screen lets you select each column and set the Data Format.
'General' converts numeric values to numbers, date values to dates, and all remaining values to text.
Column data format
General
Text
Date: MDY
Do not import column (Skip)
Data preview
General General General General General General General
08/10/04 6:32:52 PM 106.700000 MHz 59.6 dBuV 45.462533
08/10/04 7:35:08 PM 106.700000 MHz 61.9 dBuV 45.477950
08/10/04 8:37:22 PM 106.700000 MHz 61.0 dBuV 45.524200
08/10/04 9:39:37 PM 106.700000 MHz 61.3 dBuV 45.432567
08/10/04 10:41:52 PM 106.700000 MHz 61.5 dBuV 45.501350
08/10/04 11:44:07 PM 106.700000 MHz 63.0 dBuV 45.490183
Cancel
< Back
Next >
Finish

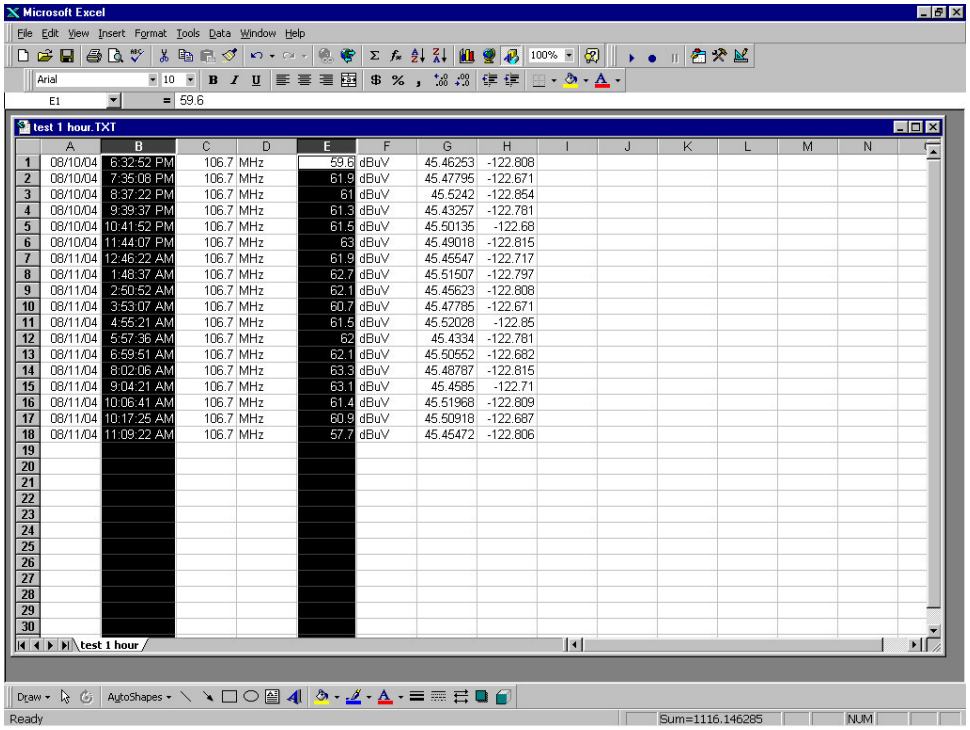
- Click the “Finish” button, the data imports to an Excel spreadsheet.



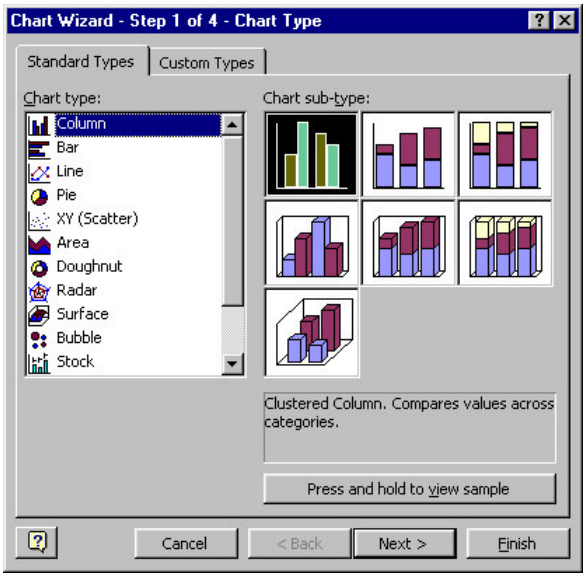
- If you see “########” in column B, the column is too narrow to show the data, double click on the boundary between the B label and the C label column headers to widen the column to the width of its contents.

- Now that the data has been imported successfully it can be shown in a Chart. Highlight the time column (B) and the signal strength column (E) by clicking on the B

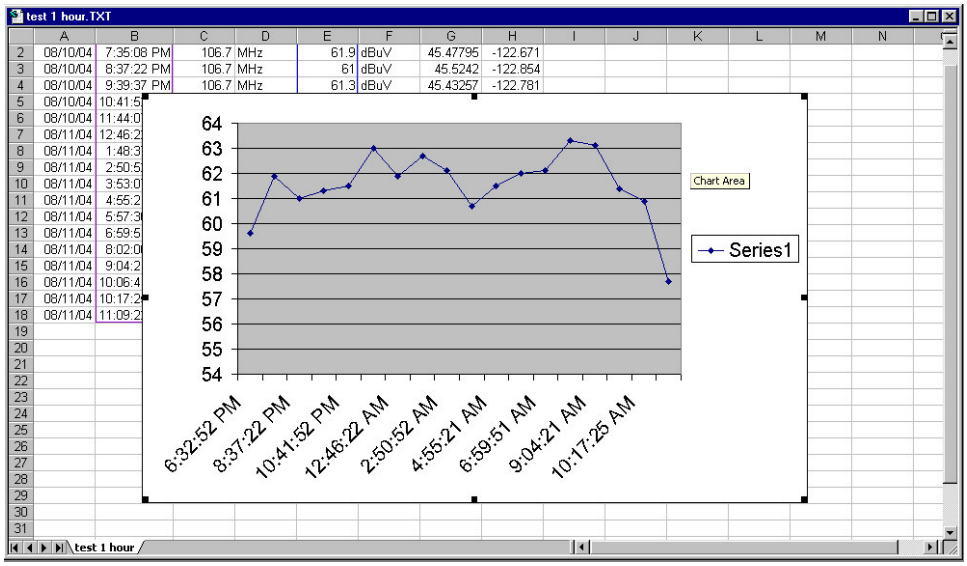
column label header then holding down the “Alt” key and clicking on the E column label header.



- Once the (B) and (E) columns are highlighted, click on the Chart Icon in the tool bar. This will open up the “Chart Wizard - Step 1 of 4 - Chart Type” window.



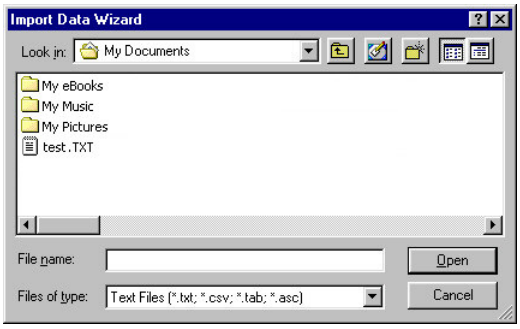
- In the “Chart Type:” area click on Line Icon then click the “Finish” button. A chart will appear over the excel data. It shows the signal strength (vertical axis) vs time (horizontal axis). The Excel Chart Wizard allows you to choose the type of chart to display your data, and by clicking Next, instead of Finish it will lead you through labeling the chart and the axis of the chart.



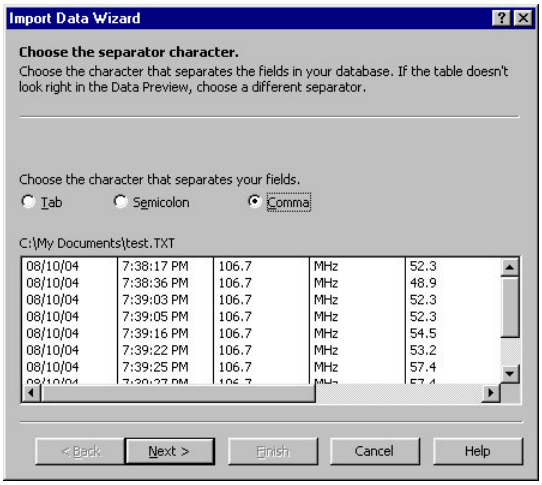
Using the Microsoft MapPoint import Wizard

For data files that include GPS Latitude and Longitude fields, the data may be imported into Microsoft MapPoint (available from your local computer software store) to create colored dots representing signal strengths on the map at the measurement locations.

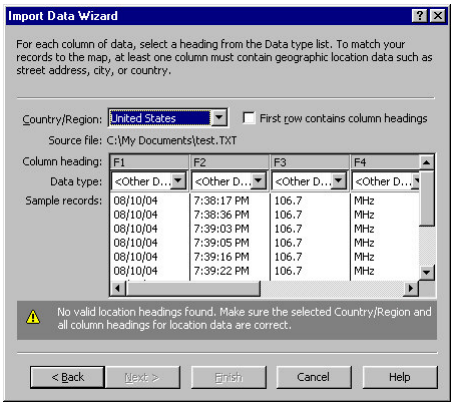
- Open Microsoft MapPoint
- Click the “Data” menu then click “Import Data Wizard” this will open the “Import Data Wizard” browse window
- Browse to the file you wish to import. In this case C:\My Documents\test.TXT



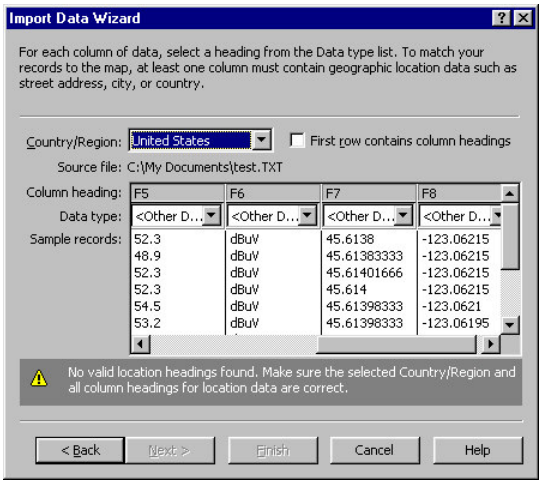
- Click on the file you want to import (in this case text.TXT) then click on the “Open” button. The MapPoint “Import Wizard” window appears.


Import Data Wizard
Choose the separator character.
Choose the character that separates the fields in your database. If the table doesn't look right in the Data Preview, choose a different separator.
Choose the character that separates your fields.
Tab
Semicolon
Comma
C:\My Documents\test.TXT
08/10/04 7:38:17 PM 106.7 MHz 52.3
08/10/04 7:38:36 PM 106.7 MHz 48.9
08/10/04 7:39:03 PM 106.7 MHz 52.3
08/10/04 7:39:05 PM 106.7 MHz 52.3
08/10/04 7:39:16 PM 106.7 MHz 54.5
08/10/04 7:39:22 PM 106.7 MHz 53.2
08/10/04 7:39:25 PM 106.7 MHz 57.4
< Back
Next >
Finish
Cancel
Help

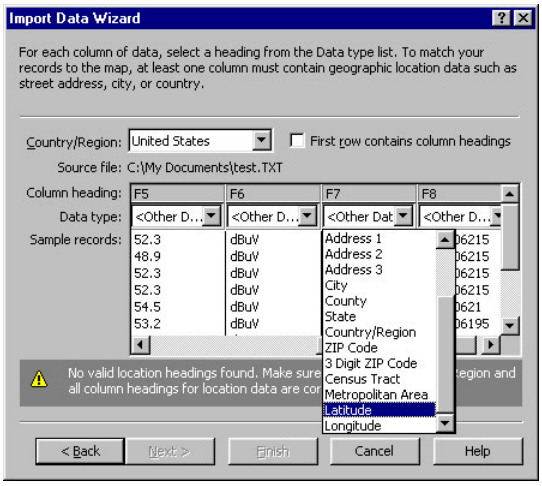
- The separator character is pre-selected to be “Comma”. Click “Next >”, the next screen of the “Data Import Wizard” appears.


Import Data Wizard
For each column of data, select a heading from the Data type list. To match your records to the map, at least one column must contain geographic location data such as street address, city, or country.
Country/Region: United States
First row contains column headings
Source file: C:\My Documents\test.TXT
Column heading: F1 F2 F3 F4
Data type: <Other D... <Other D... <Other D... <Other D...
Sample records:
08/10/04 7:38:17 PM 106.7 MHz
08/10/04 7:38:36 PM 106.7 MHz
08/10/04 7:39:03 PM 106.7 MHz
08/10/04 7:39:05 PM 106.7 MHz
08/10/04 7:39:16 PM 106.7 MHz
08/10/04 7:39:22 PM 106.7 MHz
No valid location headings found. Make sure the selected Country/Region and all column headings for location data are correct.
< Back
Next >
Finish
Cancel
Help

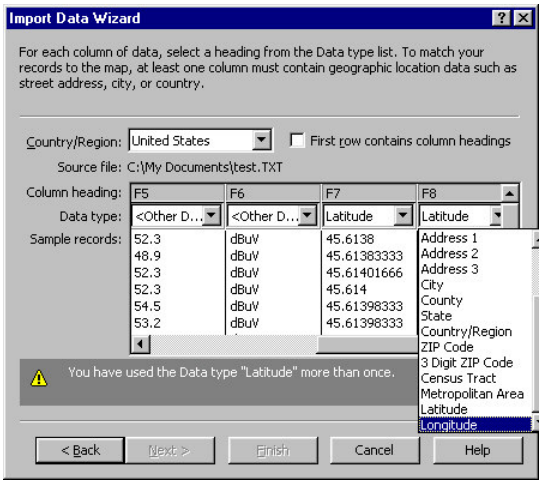
- Each field of the data file is listed with Column Headings F1, F2, F3, etc. As you scroll to the right most fields you will see that the signal strength field is F5, the Latitude field is F7, and the Longitude field is F8. Drag the scroll bar to the right to see the right most fields.


Import Data Wizard
For each column of data, select a heading from the Data type list. To match your records to the map, at least one column must contain geographic location data such as street address, city, or country.
Country/Region: United States
First row contains column headings
Source file: C:\My Documents\test.TXT
Column heading: F5 F6 F7 F8
Data type: <Other D... <Other D... <Other D... <Other D...
Sample records:
52.3 dBuV 45.6138 -123.06215
48.9 dBuV 45.61383333 -123.06215
52.3 dBuV 45.61401666 -123.06215
52.3 dBuV 45.614 -123.06215
54.5 dBuV 45.61398333 -123.0621
53.2 dBuV 45.61398333 -123.06195
No valid location headings found. Make sure the selected Country/Region and all column headings for location data are correct.
< Back
Next >
Finish
Cancel
Help

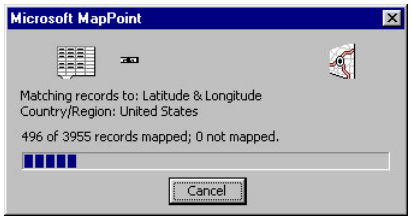
- Click on the Data Type box of the F7 Column and you see a list of data types, scroll down in the list to see “Latitude”, Click on “Latitude”



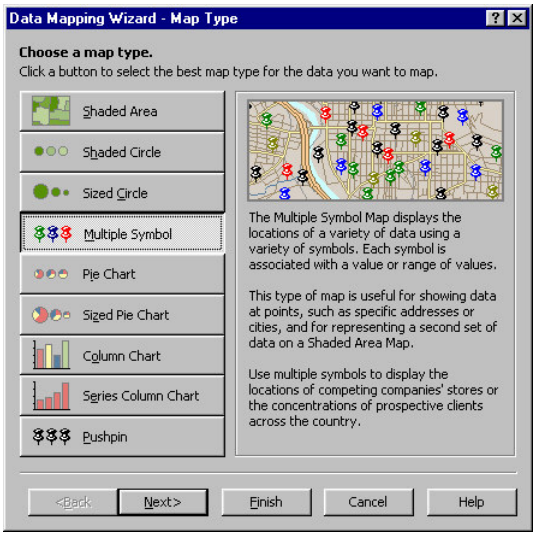
- Click on the Data Type box of the F8 Column and you see a list of data types, scroll down in the list to see “Longitude”, Click on “Longitude”



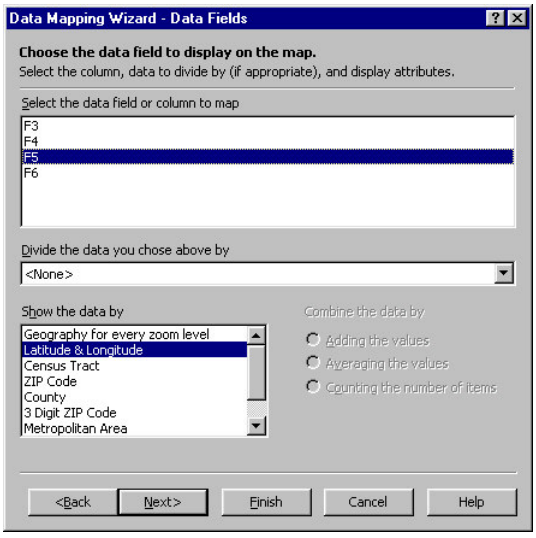
- The “Finish” button will become enabled. Click on the “Finish” button. The data import process will begin. A progress bar will appear.


Microsoft MapPoint
Matching records to: Latitude & Longitude
Country/Region: United States
496 of 3955 records mapped; 0 not mapped.
Cancel

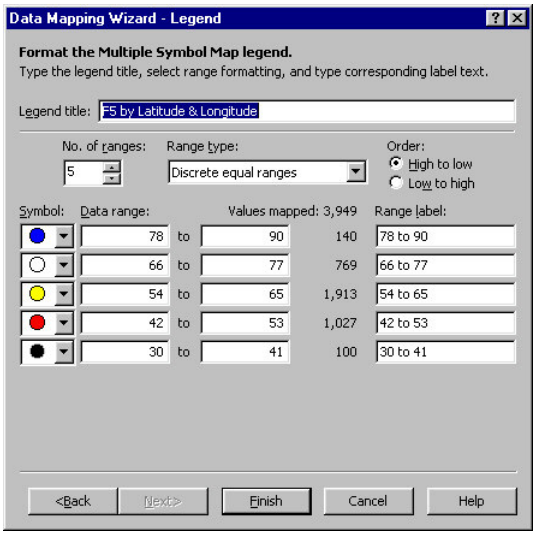
- When the data Importing has been completed, a “Data Mapping Wizard – Map Type” window appears. This wizard will guide you through the choices of how to map the data.


Data Mapping Wizard - Map Type
Choose a map type.
Click a button to select the best map type for the data you want to map.
Shaded Area
Shaded Circle
Sized Circle
Multiple Symbol
Pie Chart
Sized Pie Chart
Column Chart
Series Column Chart
Pushpin
The Multiple Symbol Map displays the locations of a variety of data using a variety of symbols. Each symbol is associated with a value or range of values.
This type of map is useful for showing data at points, such as specific addresses or cities, and for representing a second set of data on a Shaded Area Map.
Use multiple symbols to display the locations of competing companies' stores or the concentrations of prospective clients across the country.
<Back
Next>
Finish
Cancel
Help

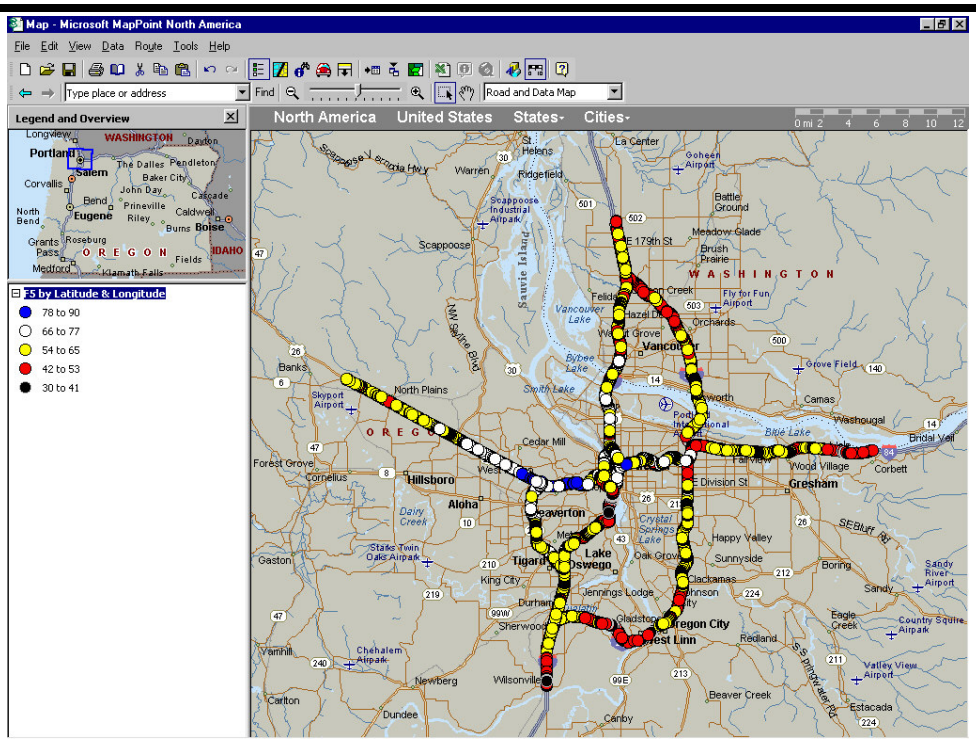
- Click on the “Multiple Symbols” choice, then click the ”Next >” button. The “Data Mapping Wizard – Data Fields” window appears.



- Remember the signal strength field was field F5. In the "Select the data filed or column to map" box click on "F5", then click the "Next>" button. The "Data Mapping Wizard – Legend" screen appears.


Data Mapping Wizard - Legend
Format the Multiple Symbol Map legend.
Type the legend title, select range formatting, and type corresponding label text.
Legend title: F5 by Latitude & Longitude
No. of ranges: 5
Range type: Discrete equal ranges
Order:
High to low
Low to high
Symbol: Data range: Values mapped: 3,949 Range label:
78 to 90 140 78 to 90
66 to 77 769 66 to 77
54 to 65 1,913 54 to 65
42 to 53 1,027 42 to 53
30 to 41 100 30 to 41
<Back
Next>
Finish
Cancel
Help

- Click the "Finish" button. The imported data appears on the MapPoint map.



Importing into 3Dfields for Contour Plotting

This import procedure is based on Z Technology Application Note 21 “Creating Signal Coverage Contour Plots from Measured Data Captured with ZTI Drive-Test Systems”

This procedure will be a bit more cumbersome than using the ZTI Drive-Test system because MeterMate software produces data in a format that must be transformed to be compatible with 3Dfields import format.

This section will describe how to transform the data from the MeterMate application using Excel, and then import the data into 3Dfields.

The accuracy of the contouring is dependant on the number of measurements made, and their distribution over the area of interest. The more the measurements and the better the distribution the better the results.

Starting with a file of data collected from a TV broadcast in Baltimore. The plotted data on the Z Technology, Inc (ZTI) Drive-Test system looks like the figure below. It is possible to upgrade your meter to a Z Technology DriveTest system and still use the data you have collected with your MeterMate software on the DriveTest system. (Contact the factory for details.)

Figure 18: Baltimore data plotted on a ZTI DriveTest system

The table below shows the format of the raw data that was collected with the MeterMate software and R-500 series with GPS Receiver attached to the recording PC.

11/17/03,21:30:02,663.25,MHz,60.5,dBuV/M,39.196932,-76.68592
11/17/03,21:30:07,663.25,MHz,60.5,dBuV/M,39.196932,-76.685923
11/17/03,21:30:13,663.25,MHz,60.5,dBuV/M,39.196933,-76.685925
11/17/03,21:30:19,663.25,MHz,60.2,dBuV/M,39.196933,-76.685927
11/17/03,21:30:24,663.25,MHz,60.5,dBuV/M,39.196935,-76.68593
11/17/03,21:30:30,663.25,MHz,60.6,dBuV/M,39.196937,-76.68593
11/17/03,21:30:36,663.25,MHz,60.2,dBuV/M,39.196937,-76.685932
11/17/03,21:30:41,663.25,MHz,60.1,dBuV/M,39.196938,-76.685933
11/17/03,21:30:47,663.25,MHz,60.2,dBuV/M,39.196938,-76.685935
11/17/03,21:30:53,663.25,MHz,60.2,dBuV/M,39.19694,-76.685935
11/17/03,21:30:58,663.25,MHz,59.8,dBuV/M,39.196942,-76.685937

The next table show below shows the desired format for import into 3Dfields.

```
Longitude,Latitude,Power
-76.68592,39.196932,60.5
-76.685923,39.196932,60.5
-76.685925,39.196933,60.5
-76.685927,39.196933,60.2
-76.68593,39.196935,60.5
-76.68593,39.196937,60.6
-76.685932,39.196937,60.2
-76.685933,39.196938,60.1
-76.685935,39.196938,60.2
-76.685935,39.19694,60.2
-76.685937,39.196942,59.8
```

Using Excel to transform data format

Excel is a powerful tool to transform tabular data from one columnar format to another. We need to re-arrange the field columns from the MeterMate order of:

Date,Time, Frequency, Frequency Units, Signal Strength, Signal Strength Units, Latitude Longitude

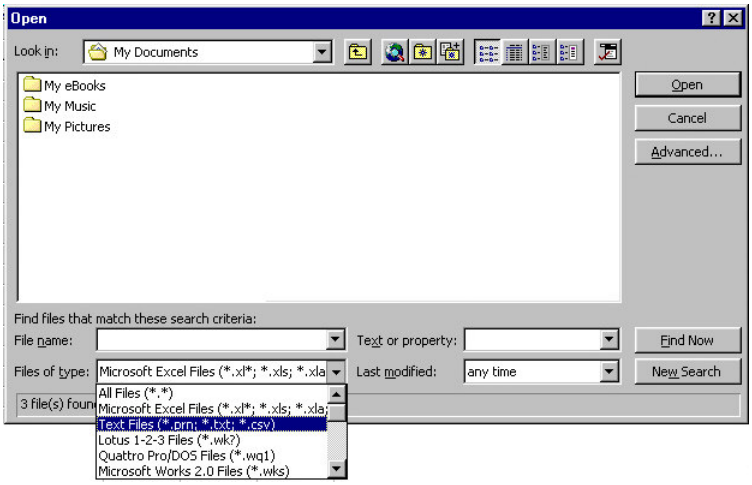
To 3Dfield import order of:

Longitude, Latitude, Power

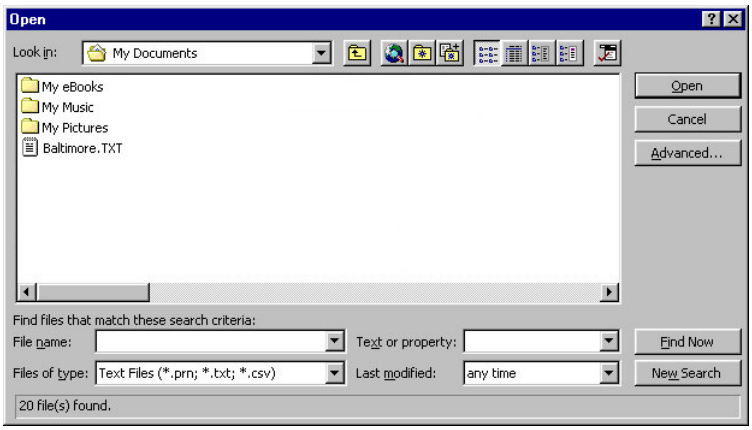
In addition we need to add the textual field column headers. Note here that “Signal Strength” is equivalent to “Power”

Follow the procedure below to do the transfomation.

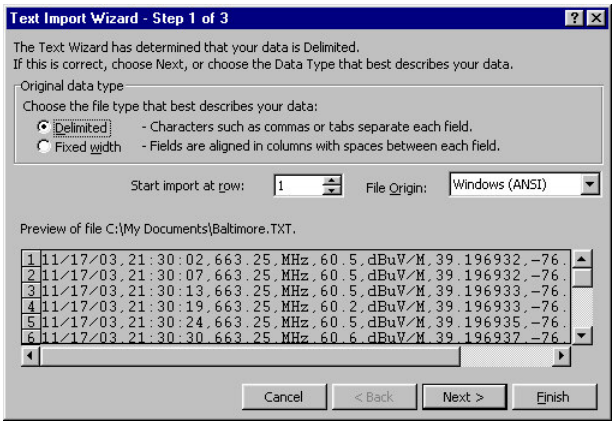
- Open Excel
- Click the “File” menu then click “Open” this will open a file “Open” browse window
- On the “Files of Type” box select “Text Files (*.prn; *.txt; *.csv)



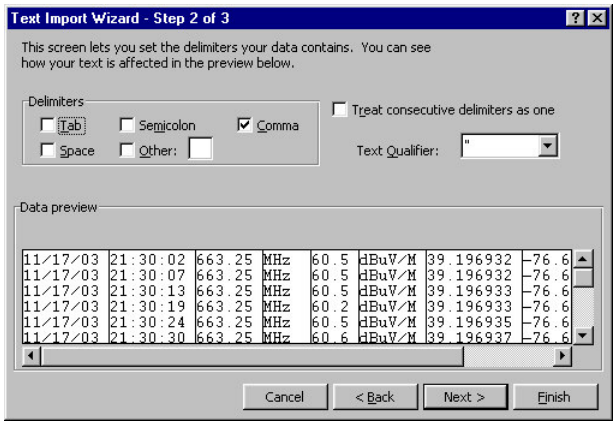
- Browse to the file you wish to import. In this case C:\My Documents\Baltimore.TXT



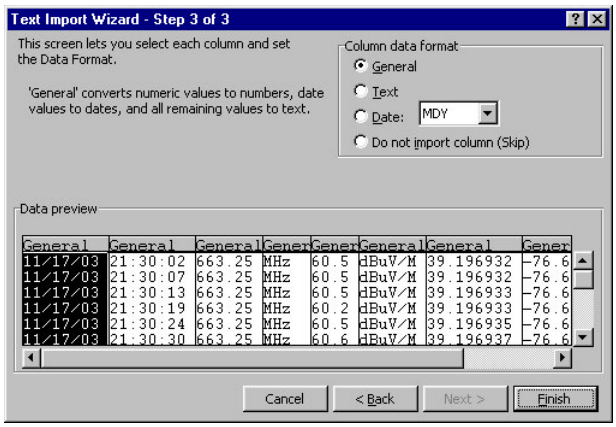
- Click on the file you want to import then click on the “Open” button. The “Text Import Wizard Step 1 of 3” window appears


Text Import Wizard - Step 1 of 3
The Text Wizard has determined that your data is Delimited.
If this is correct, choose Next, or choose the Data Type that best describes your data.
Original data type
Choose the file type that best describes your data:
Delimited - Characters such as commas or tabs separate each field.
Fixed width - Fields are aligned in columns with spaces between each field.
Start import at row:
1
File Origin:
Windows (ANSI)
Preview of file C:\My Documents\Baltimore.TXT.
1 11/17/03,21:30:02,663.25,MHz,60.5,dBuV/M,39.196932,-76.
2 11/17/03,21:30:07,663.25,MHz,60.5,dBuV/M,39.196932,-76.
3 11/17/03,21:30:13,663.25,MHz,60.5,dBuV/M,39.196933,-76.
4 11/17/03,21:30:19,663.25,MHz,60.2,dBuV/M,39.196933,-76.
5 11/17/03,21:30:24,663.25,MHz,60.5,dBuV/M,39.196935,-76.
6 11/17/03,21:30:30,663.25,MHz,60.6,dBuV/M,39.196937,-76.
Cancel
< Back
Next >
Finish

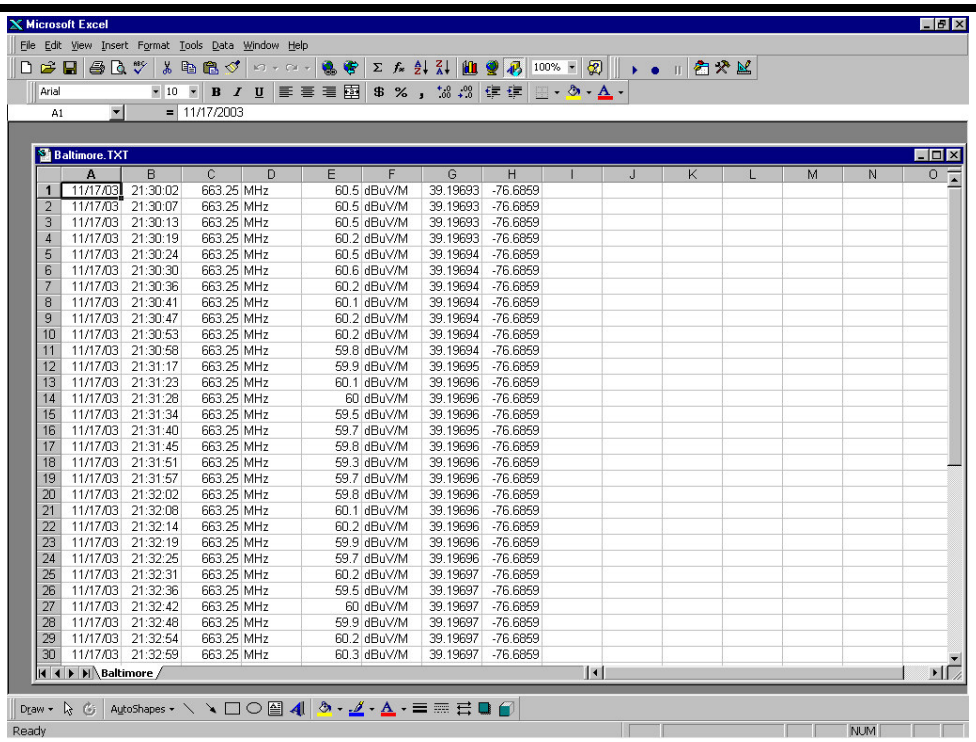
- Click the “Next>” button, the “Text Import Wizard – Step 2 of 3” appears.


Text Import Wizard - Step 2 of 3
This screen lets you set the delimiters your data contains. You can see how your text is affected in the preview below.
Delimiters
Tab
Semicolon
Comma
Space
Other:
Treat consecutive delimiters as one
Text Qualifier:
Data preview
11/17/03 21:30:02 663.25 MHz 60.5 dBuV/M 39.196932 -76.6
11/17/03 21:30:07 663.25 MHz 60.5 dBuV/M 39.196932 -76.6
11/17/03 21:30:13 663.25 MHz 60.5 dBuV/M 39.196933 -76.6
11/17/03 21:30:19 663.25 MHz 60.2 dBuV/M 39.196933 -76.6
11/17/03 21:30:24 663.25 MHz 60.5 dBuV/M 39.196935 -76.6
11/17/03 21:30:30 663.25 MHz 60.6 dBuV/M 39.196937 -76.6
Cancel
< Back
Next >
Finish

- Un-check the “Tab” box and click the “Comma” box note that the fields line up in columns in the text display. Click “Next”, the “Text Import Wizard Step 3 of 3” appears.


Text Import Wizard - Step 3 of 3
This screen lets you select each column and set the Data Format.
'General' converts numeric values to numbers, date values to dates, and all remaining values to text.
Column data format
General
Text
Date:
MDY
Do not import column (Skip)
Data preview
General General General Gener Gener General General Gener
11/17/03 21:30:02 663.25 MHz 60.5 dBuV/M 39.196932 -76.6
11/17/03 21:30:07 663.25 MHz 60.5 dBuV/M 39.196932 -76.6
11/17/03 21:30:13 663.25 MHz 60.5 dBuV/M 39.196933 -76.6
11/17/03 21:30:19 663.25 MHz 60.2 dBuV/M 39.196933 -76.6
11/17/03 21:30:24 663.25 MHz 60.5 dBuV/M 39.196935 -76.6
11/17/03 21:30:30 663.25 MHz 60.6 dBuV/M 39.196937 -76.6
Cancel
< Back
Next >
Finish

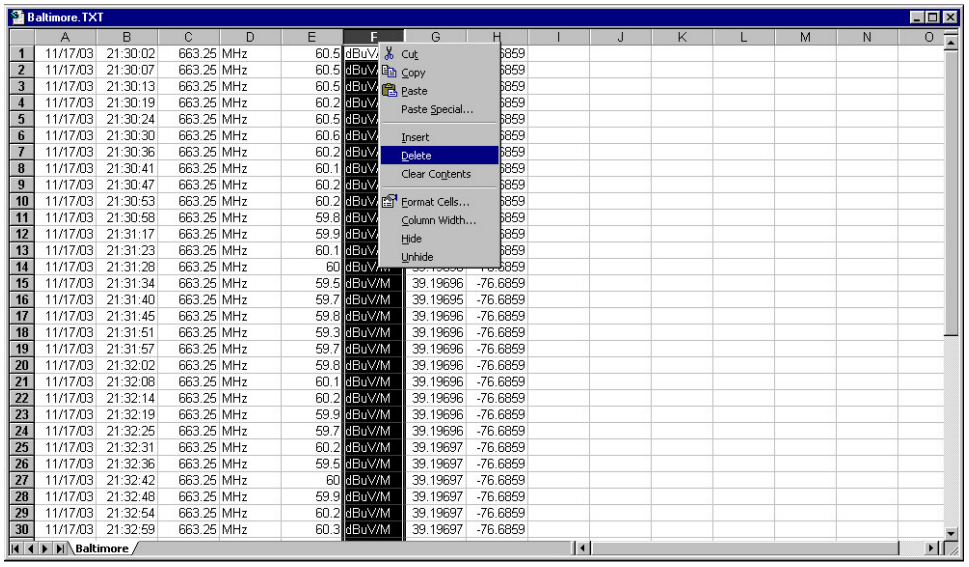
- Click the “Finish” button, the data imports to an Excel spreadsheet.



	A	B	C	D	E	F	G	H
1	11/17/03	21:30:02	663.25	MHz	60.5	dBuV/M	39.19693	-76.6859
2	11/17/03	21:30:07	663.25	MHz	60.5	dBuV/M	39.19693	-76.6859
3	11/17/03	21:30:13	663.25	MHz	60.5	dBuV/M	39.19693	-76.6859
4	11/17/03	21:30:19	663.25	MHz	60.2	dBuV/M	39.19693	-76.6859
5	11/17/03	21:30:24	663.25	MHz	60.5	dBuV/M	39.19694	-76.6859
6	11/17/03	21:30:30	663.25	MHz	60.6	dBuV/M	39.19694	-76.6859
7	11/17/03	21:30:36	663.25	MHz	60.2	dBuV/M	39.19694	-76.6859
8	11/17/03	21:30:41	663.25	MHz	60.1	dBuV/M	39.19694	-76.6859
9	11/17/03	21:30:47	663.25	MHz	60.2	dBuV/M	39.19694	-76.6859
10	11/17/03	21:30:53	663.25	MHz	60.2	dBuV/M	39.19694	-76.6859
11	11/17/03	21:30:58	663.25	MHz	59.8	dBuV/M	39.19694	-76.6859
12	11/17/03	21:31:17	663.25	MHz	59.9	dBuV/M	39.19695	-76.6859
13	11/17/03	21:31:23	663.25	MHz	60.1	dBuV/M	39.19696	-76.6859
14	11/17/03	21:31:28	663.25	MHz	60	dBuV/M	39.19696	-76.6859
15	11/17/03	21:31:34	663.25	MHz	59.5	dBuV/M	39.19696	-76.6859
16	11/17/03	21:31:40	663.25	MHz	59.7	dBuV/M	39.19695	-76.6859
17	11/17/03	21:31:45	663.25	MHz	59.8	dBuV/M	39.19696	-76.6859
18	11/17/03	21:31:51	663.25	MHz	59.3	dBuV/M	39.19696	-76.6859
19	11/17/03	21:31:57	663.25	MHz	59.7	dBuV/M	39.19696	-76.6859
20	11/17/03	21:32:02	663.25	MHz	59.8	dBuV/M	39.19696	-76.6859
21	11/17/03	21:32:08	663.25	MHz	60.1	dBuV/M	39.19696	-76.6859
22	11/17/03	21:32:14	663.25	MHz	60.2	dBuV/M	39.19696	-76.6859
23	11/17/03	21:32:19	663.25	MHz	59.9	dBuV/M	39.19696	-76.6859
24	11/17/03	21:32:25	663.25	MHz	59.7	dBuV/M	39.19696	-76.6859
25	11/17/03	21:32:31	663.25	MHz	60.2	dBuV/M	39.19697	-76.6859
26	11/17/03	21:32:36	663.25	MHz	59.5	dBuV/M	39.19697	-76.6859
27	11/17/03	21:32:42	663.25	MHz	60	dBuV/M	39.19697	-76.6859
28	11/17/03	21:32:48	663.25	MHz	59.9	dBuV/M	39.19697	-76.6859
29	11/17/03	21:32:54	663.25	MHz	60.2	dBuV/M	39.19697	-76.6859
30	11/17/03	21:32:59	663.25	MHz	60.3	dBuV/M	39.19697	-76.6859

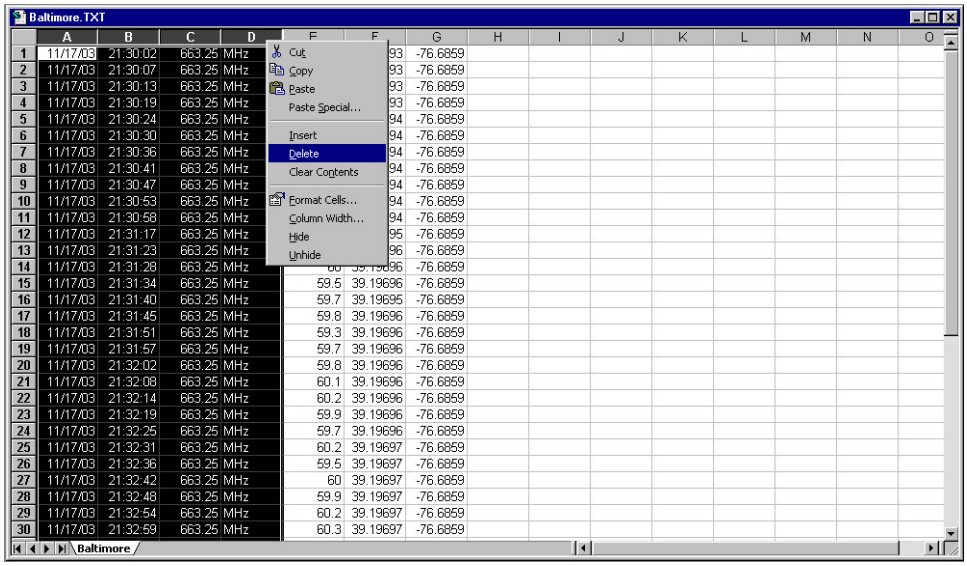
- If you see "########" in column B, the column is too narrow to show the data, double click on the boundary between the B label and the C label column headers to widen the column to the width of its contents.

- Columns A through D and column F are not needed so delete them. Click on the F label of the column F header to highlight that column, then Right Click on it then select "Delete"

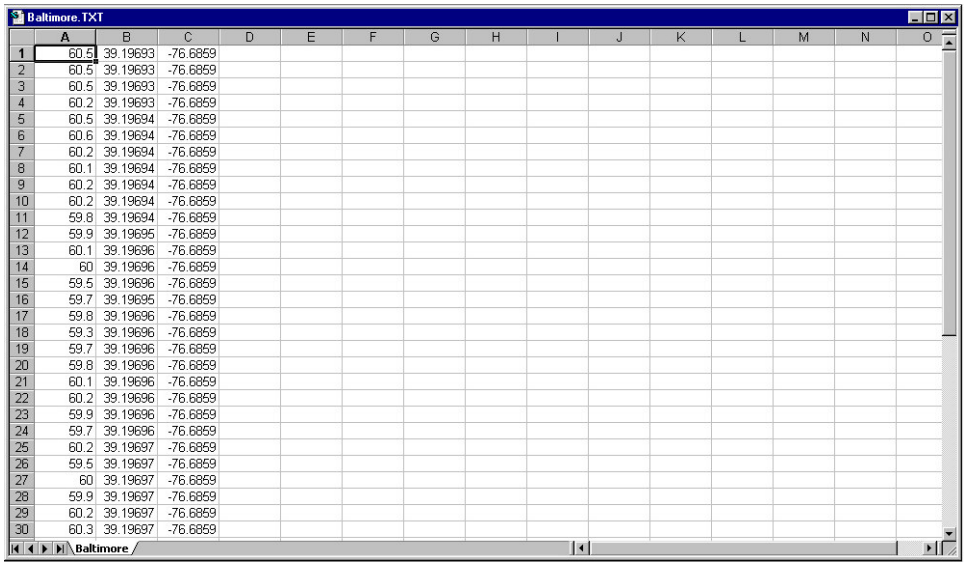


	A	B	C	D	E	F	G	H
1	11/17/03	21:30:02	663.25	MHz	60.5	dBuV/M	39.19696	-76.6859
2	11/17/03	21:30:07	663.25	MHz	60.5	dBuV/M	39.19695	-76.6859
3	11/17/03	21:30:13	663.25	MHz	60.5	dBuV/M	39.19696	-76.6859
4	11/17/03	21:30:19	663.25	MHz	60.2	dBuV/M	39.19696	-76.6859
5	11/17/03	21:30:24	663.25	MHz	60.5	dBuV/M	39.19696	-76.6859
6	11/17/03	21:30:30	663.25	MHz	60.6	dBuV/M	39.19696	-76.6859
7	11/17/03	21:30:36	663.25	MHz	60.2	dBuV/M	39.19696	-76.6859
8	11/17/03	21:30:41	663.25	MHz	60.1	dBuV/M	39.19696	-76.6859
9	11/17/03	21:30:47	663.25	MHz	60.2	dBuV/M	39.19696	-76.6859
10	11/17/03	21:30:53	663.25	MHz	60.2	dBuV/M	39.19696	-76.6859
11	11/17/03	21:30:58	663.25	MHz	59.8	dBuV/M	39.19696	-76.6859
12	11/17/03	21:31:17	663.25	MHz	59.9	dBuV/M	39.19696	-76.6859
13	11/17/03	21:31:23	663.25	MHz	60.1	dBuV/M	39.19696	-76.6859
14	11/17/03	21:31:28	663.25	MHz	60	dBuV/M	39.19696	-76.6859
15	11/17/03	21:31:34	663.25	MHz	59.5	dBuV/M	39.19696	-76.6859
16	11/17/03	21:31:40	663.25	MHz	59.7	dBuV/M	39.19695	-76.6859
17	11/17/03	21:31:45	663.25	MHz	59.8	dBuV/M	39.19696	-76.6859
18	11/17/03	21:31:51	663.25	MHz	59.3	dBuV/M	39.19696	-76.6859
19	11/17/03	21:31:57	663.25	MHz	59.7	dBuV/M	39.19696	-76.6859
20	11/17/03	21:32:02	663.25	MHz	59.8	dBuV/M	39.19696	-76.6859
21	11/17/03	21:32:08	663.25	MHz	60.1	dBuV/M	39.19696	-76.6859
22	11/17/03	21:32:14	663.25	MHz	60.2	dBuV/M	39.19696	-76.6859
23	11/17/03	21:32:19	663.25	MHz	59.9	dBuV/M	39.19696	-76.6859
24	11/17/03	21:32:25	663.25	MHz	59.7	dBuV/M	39.19696	-76.6859
25	11/17/03	21:32:31	663.25	MHz	60.2	dBuV/M	39.19697	-76.6859
26	11/17/03	21:32:36	663.25	MHz	59.5	dBuV/M	39.19697	-76.6859
27	11/17/03	21:32:42	663.25	MHz	60	dBuV/M	39.19697	-76.6859
28	11/17/03	21:32:48	663.25	MHz	59.9	dBuV/M	39.19697	-76.6859
29	11/17/03	21:32:54	663.25	MHz	60.2	dBuV/M	39.19697	-76.6859
30	11/17/03	21:32:59	663.25	MHz	60.3	dBuV/M	39.19697	-76.6859

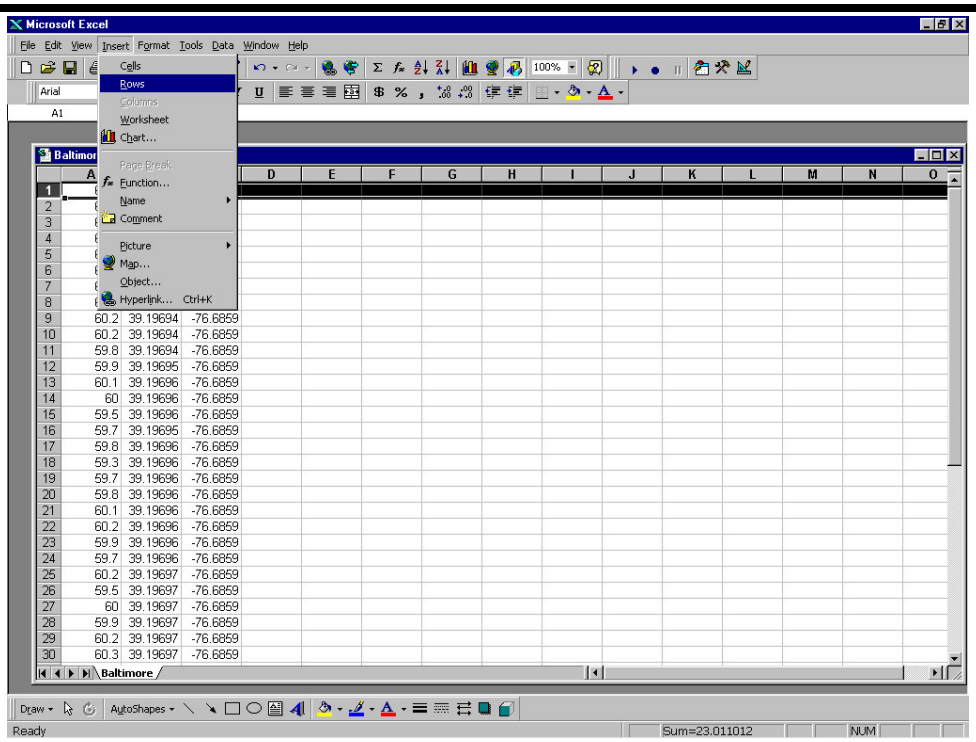
- The 2 most right columns move left as the old F column was deleted.
- Click on the A label header of the A column, hold the Shift key down then Click on the D label of the D column header to highlight columns A through D. Then Right Click on the D label and select “Delete”.



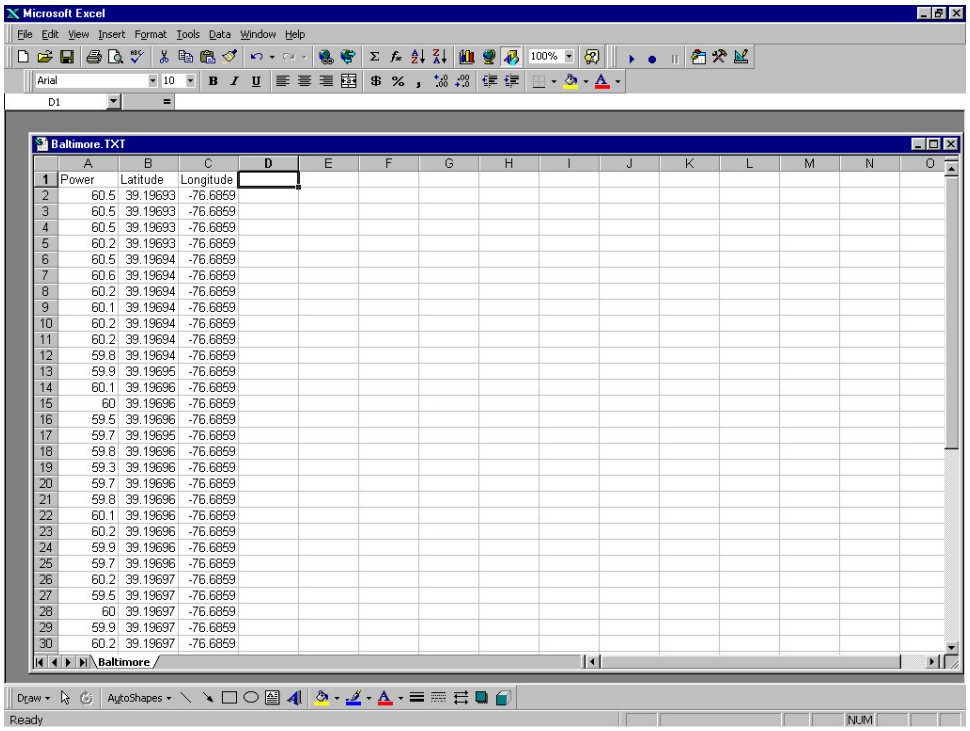
- The remaining three columns move left.



- We now have just the data needed for 3Dfields, but we need to change the order of the fields and add textual headers in the first row of each column.
- Click on the “1” label to highlight the first row, then Click on the “Insert” Menu and click on “Row”

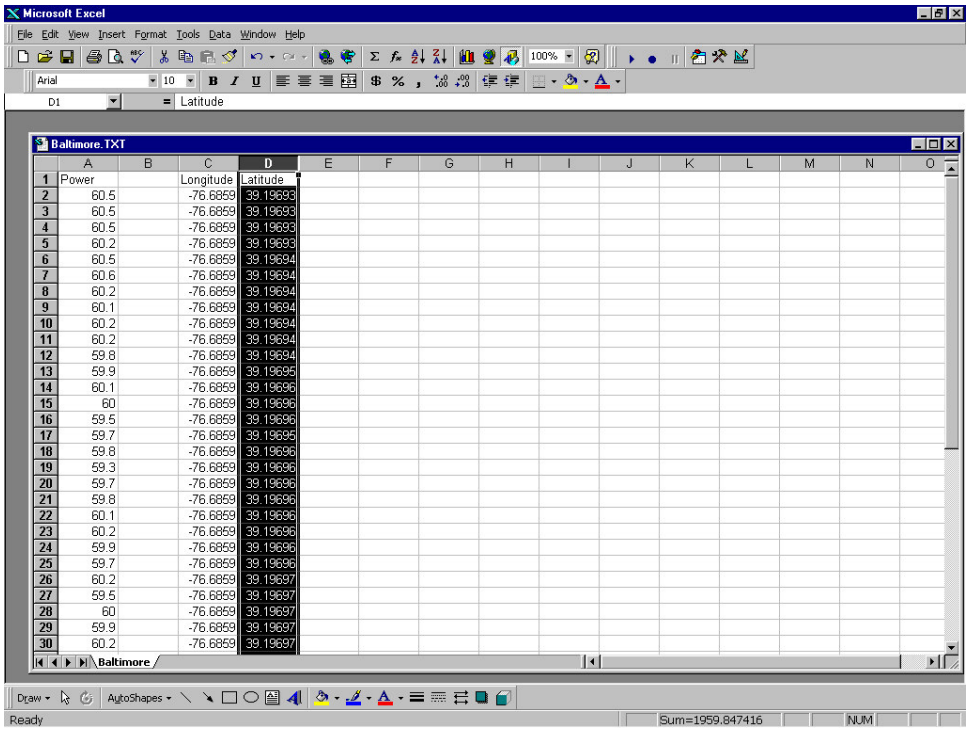


- In the new row type in “Power” in the left most column header, type in “Latitude ” in the middle row column header, type in “Longitude” in the right most column header.



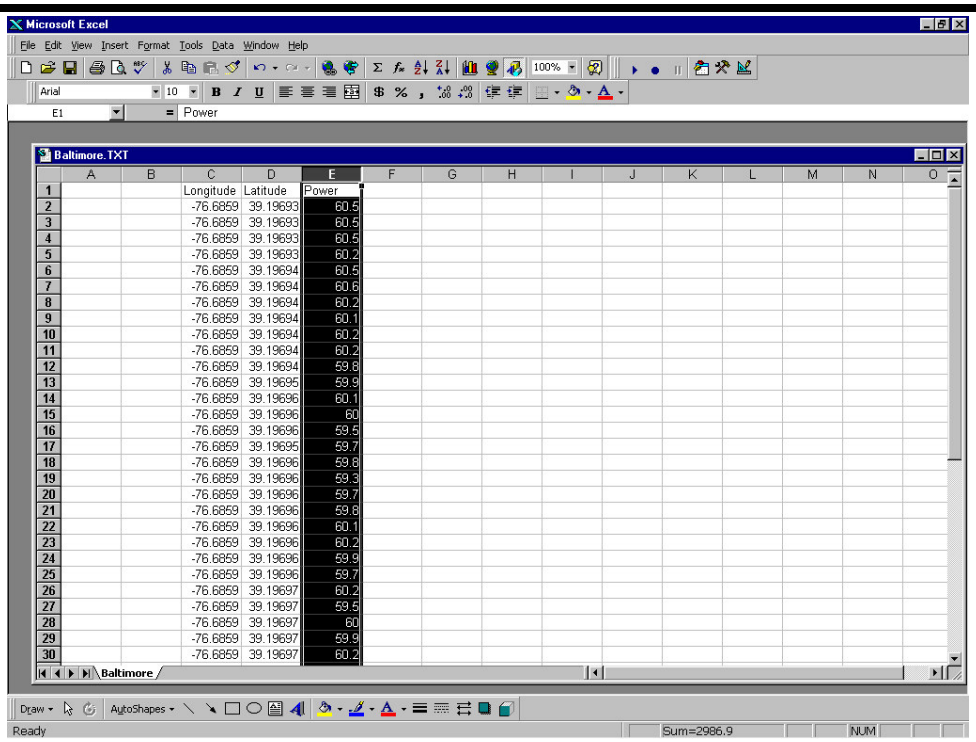
- The column headers have been added now we need to re-arrange the columns so they are in the order of “Longitude, Latitude, Power”.

- Click on the B column label to highlight the ‘Latitude’ column. Click on the “Edit” Menu then click on “Cut” the B column will show a rotating dotted line around it. Click on the D column label, then Click on the “Edit” menu again and click on “Paste”. The ‘Latitude’ column will now be the right most column.

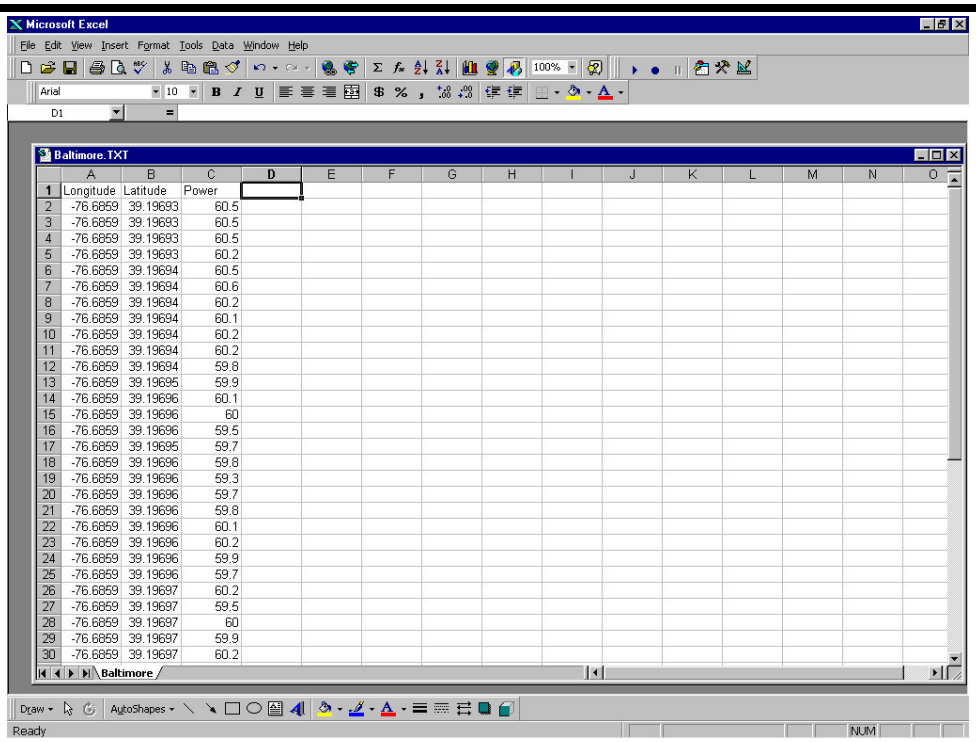


	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Power		Longitude	Latitude											
2	60.5		-76.6859	39.19693											
3	60.5		-76.6859	39.19693											
4	60.5		-76.6859	39.19693											
5	60.2		-76.6859	39.19693											
6	60.5		-76.6859	39.19694											
7	60.6		-76.6859	39.19694											
8	60.2		-76.6859	39.19694											
9	60.1		-76.6859	39.19694											
10	60.2		-76.6859	39.19694											
11	60.2		-76.6859	39.19694											
12	59.8		-76.6859	39.19694											
13	59.9		-76.6859	39.19695											
14	60.1		-76.6859	39.19696											
15	60		-76.6859	39.19696											
16	59.5		-76.6859	39.19696											
17	59.7		-76.6859	39.19695											
18	59.8		-76.6859	39.19696											
19	59.3		-76.6859	39.19696											
20	59.7		-76.6859	39.19696											
21	59.8		-76.6859	39.19696											
22	60.1		-76.6859	39.19696											
23	60.2		-76.6859	39.19696											
24	59.9		-76.6859	39.19696											
25	59.7		-76.6859	39.19696											
26	60.2		-76.6859	39.19697											
27	59.5		-76.6859	39.19697											
28	60		-76.6859	39.19697											
29	59.9		-76.6859	39.19697											
30	60.2		-76.6859	39.19697											

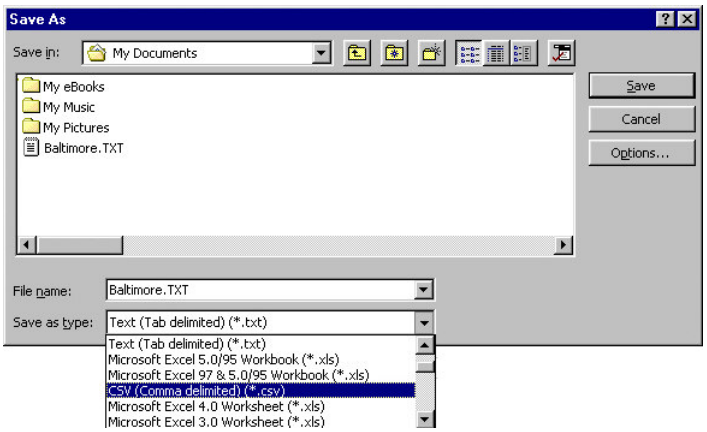
- Click on the A column label to highlight the ‘Power’ column. Click on the “Edit” Menu then click on “Cut” the A column will show a rotating dotted line around it. Click on the E column label, then Click on the “Edit” menu again and click on “Paste”. The ‘Power’ column will now be the right most column.



- Now the fields are in the desired order, we just need to remove the first two empty column, A & B. Click on the A label hold the Shift key down then click on the B label. This highlights the two empty columns. Click on the "Edit" menu then Click "Delete". The two blank columns are removed and the data is now correctly formatted for 3Dfields.



- Now save the file. Click the “File” menu, then click SaveAs



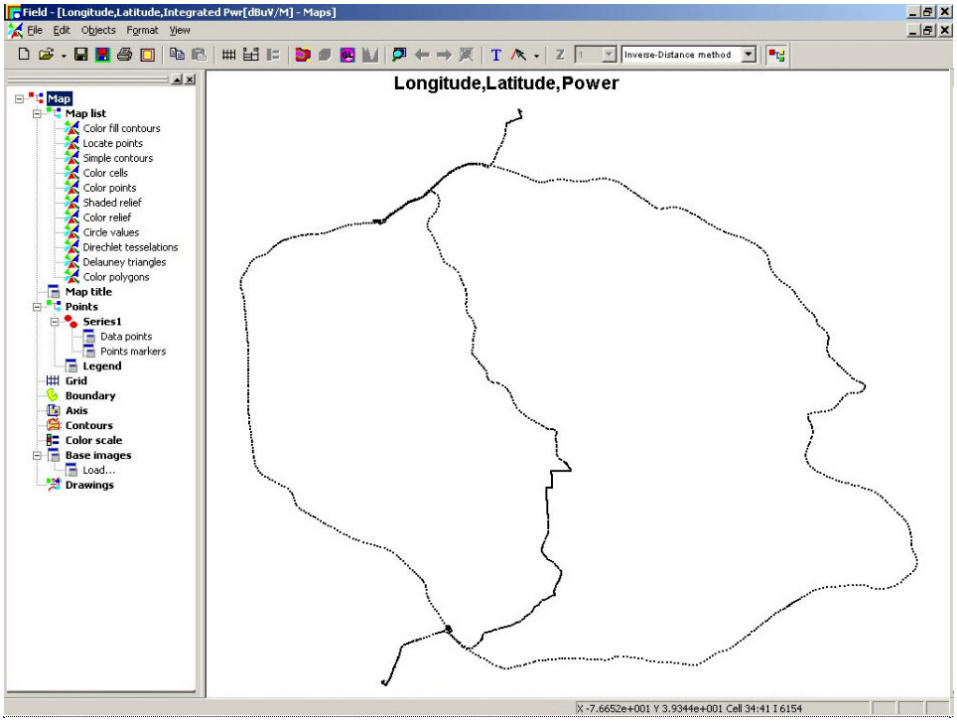
- Under “Save as Type” Select “CSV [Comma delimited] (*.csv)” , then change the name from “Baltimore.TXT “ Baltimore3D.CSV, then click the “Save” button. Excel may respond with a message saying that the file is not in Excel format, Do you want to save to Excel format, Click “No”

- Close Excel.

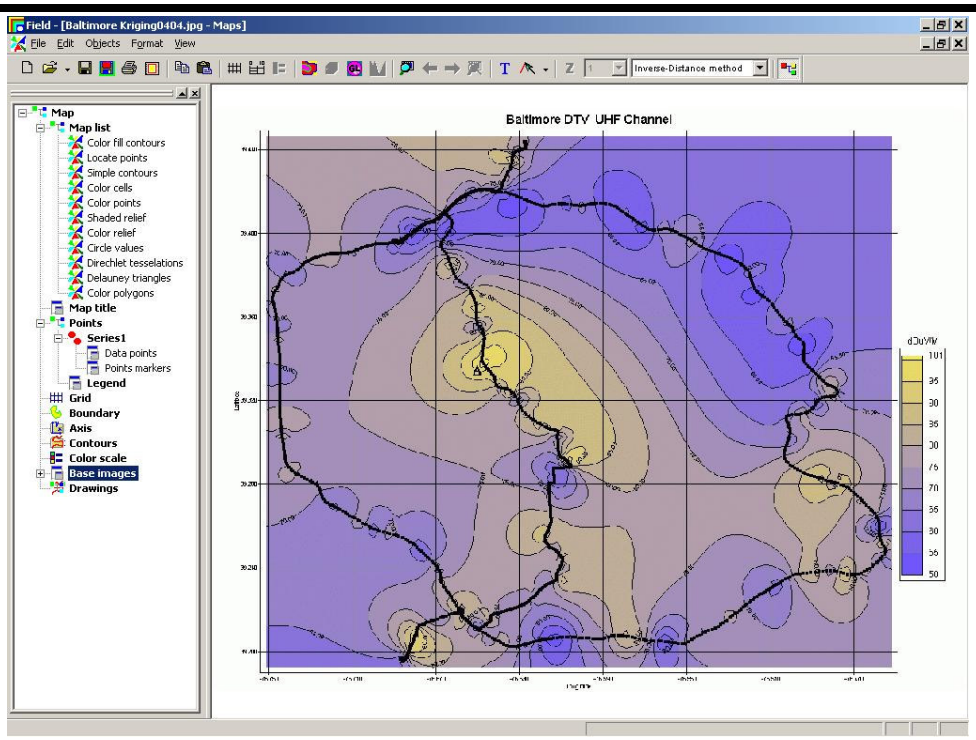
- The “.CSV” filename extension was necessary for Excel, we need to change the filename extension back to “.TXT” for 3Dfields. Open MyDocuments and rename “Baltimore3D.CSV” to “Baltimore3D.TXT”. A system message may appear “If you change a filename extension, the file may become unusable, do you want to change?” Click YES.

Using the transformed data in 3DFields

- Open 3Dfields
- Click the “File” menu then Click “Open”. A browse window opens. Browse to C:\My Documents. Double click on the transformed file “Baltimore3D.TXT”. 3Dfields will display a “dot trail” of the measured locations.



- Click the "Objects" menu, then Click "Gridding Method". For the first time through select "Inverse-Distance Method". (You may want to try some of the other methods later "System of Linear Equations, or "Kriging".
- Click the "Format" menu, then Click "Map Bar". This divides the active screen into two sections.
- In the left side you see a tree structure of choices. Click on the “Map List” branch of this tree, then double click on "Color Fill Contours". A "Create contours" window appears. Choose the default values by Clicking "OK". The resultant plot is the desired Color Contour Plot we have been working towards.



3Dfield provides the user with several ways to enhance the basic Contour Plot described above. The user can customize colors, number of contour lines, graph titles, add an X-Y Axis (see the Axis selection in the 'tree' on the left), etc. 3Dfield even provides an easy way to Print the Contour Plot. The Application also will allow a user to store Plots within separate job folders for quick retrieval without the necessity to remember the initial conditions selected when the contour plots were first calculated. The printed contour map appears in the figure below.

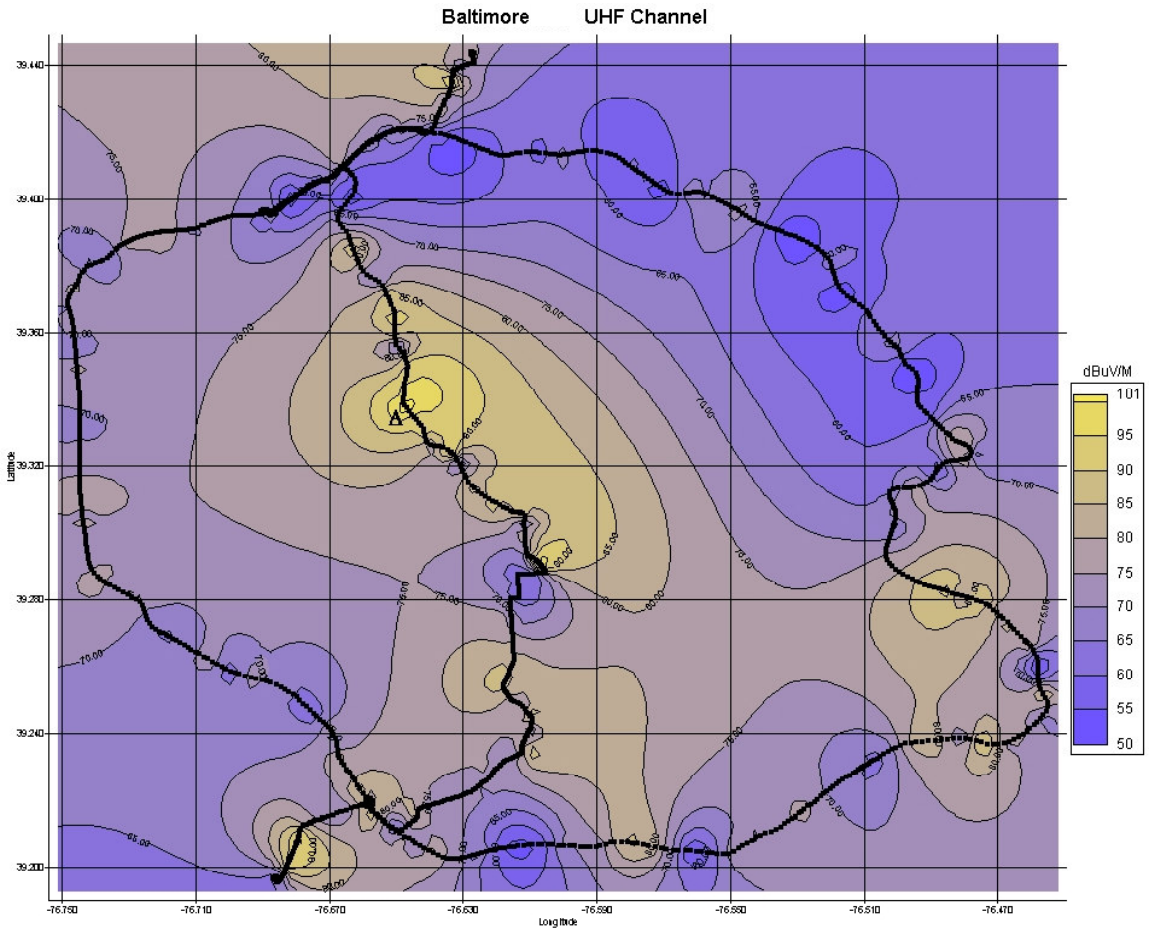


Figure 19: 3Dfield - Contours Calculated with "Inverse-Distance Method"

Contour Plots provide another tool to evaluate, analyze and display signal coverage measurements. They can be a valuable tool for estimating coverage beyond the actual measured locations and can provide extrapolations of expected coverage over an entire service area. The method described here is an excellent addition to an engineer's tool-set for understanding performance of a single RF transmitter or an entire wireless or broadcast network.

Of course, 3Dfield and all other Contouring programs have their limitations (for example 3Dfield does not directly take into account terrain or man-made obstructions.) When this is understood, the operator can make full and effective use of Contour Plots.

Always remember if actual and precise data is required at a specific location, the best approach is to take real measured data at that location using one of Z Technology's R-500 series Field Strength Meter, or Z Technology integrated DriveTest system.